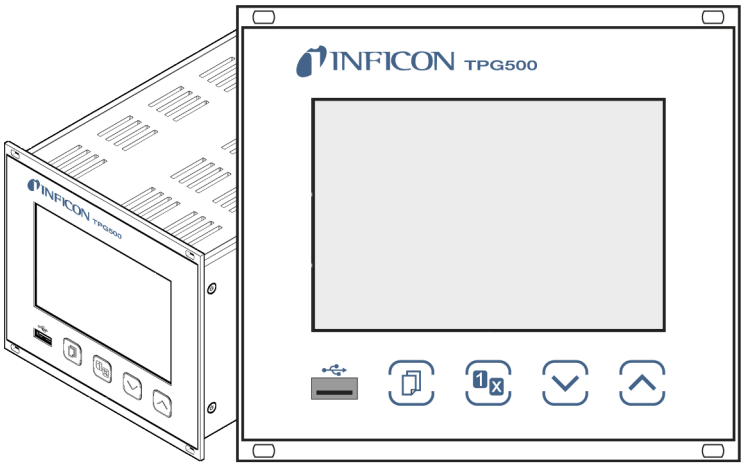
Operating Manual
Incl. EU Declaration of Conformity

Total Pressure Gauge Controller

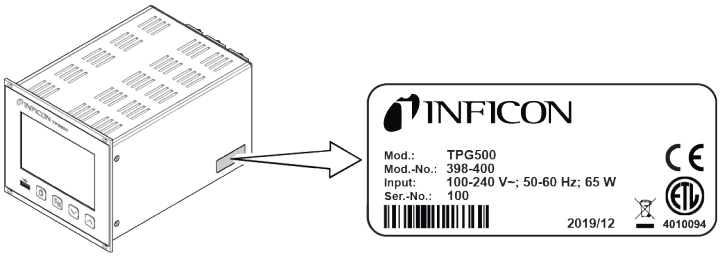
TPG500



CE

Product Identification

In all communications with INFICON, please specify the information on the product nameplate.



Specimen nameplate

Validity

This document applies to products with part numbers:

IO398400 / 398-400 (TPG500)

The part number (Mod.-No) can be found on the product nameplate.

This manual is based on firmware version V1.30.

If your unit does not work as described in this document, please check that it is equipped with the above firmware version (→ 🗎 47).

We reserve the right to make technical changes without prior notice.

All dimensions are indicated in mm.

Intended Use

Depending on the options chosen, the TPG500 can measure total pressure from atmosphere to 10^{-11} mbar. It can trigger a number of pressure-dependent functions to control and monitor vacuum devices and processes. The instructions contained in this document must be strictly followed.

Scope of Delivery

The scope of delivery consists of the following parts:

1 Control Unit
1 Power cord
1 Accessories kit
- 4 collar screws and synthetic nipple
- 1 rubber strip
- 2 self-adhesive rubber feet
- 4 banana plugs, 2 mm, red
- 4 banana plugs, 2 mm, black
- 1 screwdriver, 2 mm

1 Installation Manual
1 CD ROM (manuals, tools, …)
1 EU Declaration of Conformity

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used; for cross-references to further documents listed under 'Literature', use is made of the symbol (→ 🕮 [Z]).

1 Safety

1.1 Symbols Used

Symbols for residual risks

DANGER

Information on preventing any kind of physical injury.

WARNING

Information on preventing extensive equipment and environmental damage.

Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

Further symbols

 Note

 Label on rear of the unit: prompt to consult the operating manual

 The lamp / display is lit

 The lamp / display flashes

 The lamp / display is dark

 Press the key (example: PARA key)

 Do not press any key

<…….> Labeling

1.2 Personnel Qualifications

Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

1.3 General Safety Instructions

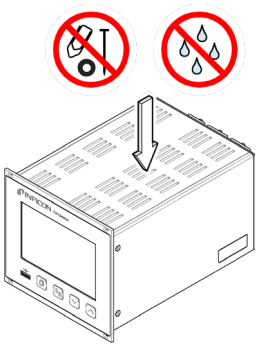
Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.

DANGER

Mains voltage

Contact with live parts is extremely hazardous when any objects are introduced or any liquids penetrate into the unit.

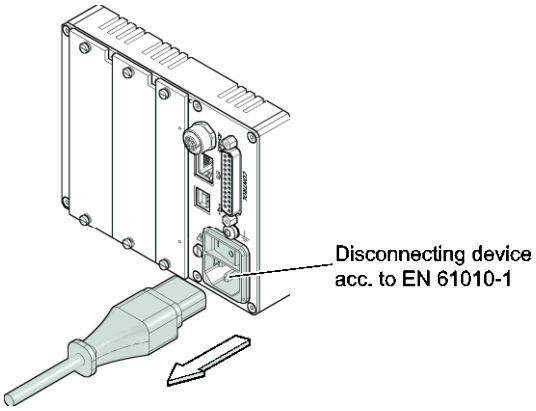
Make sure no objects enter through the louvers and no liquids penetrate into the equipment.



Disconnecting device

The disconnecting device must be readily identifiable by and easily reached by the user.

To disconnect the unit from the mains supply, you must unplug the mains cable.



Communicate the safety instructions to all other users.

1.4 Liability and Warranty

INFICON assumes no liability and the warranty is rendered null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

2 System Overview

2.1 Basic Unit

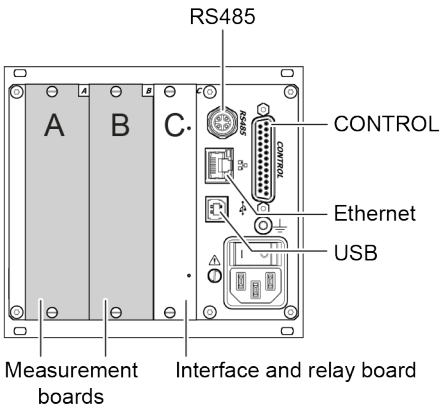
TPG500, Technical Data → 🗎 9.

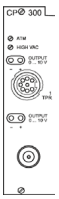
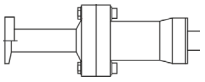
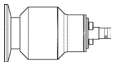
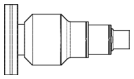
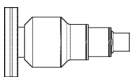
A list of all plug-in boards suited for the TPG500 can be found on → 🗎 8.

For detailed information on the plug-in boards → 🕮 [1].

2.2 Measurement Plug-In Boards

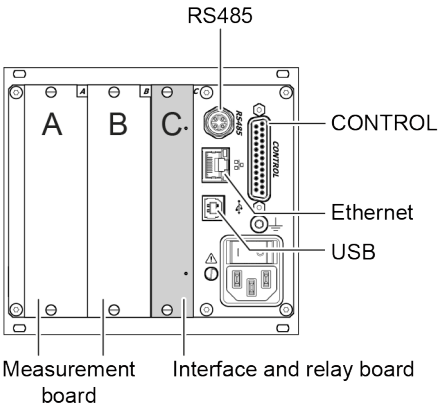
Two slots (A and B) at the back of the TPG500 can accommodate up to two measurement boards.

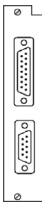
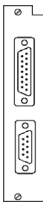
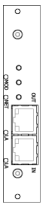


Measurement plug-in board:	Pirani / cold cathode combined 	
	CP300C9	CP300T11 CP300T11L
Compatible gauges:		
TPR018 	•	•
IKR084 	•	
IKR085 	•	•
IKR086 		•

2.3 Interface and Relay Plug-In Boards

An interface and relay board can be plugged into slot C.



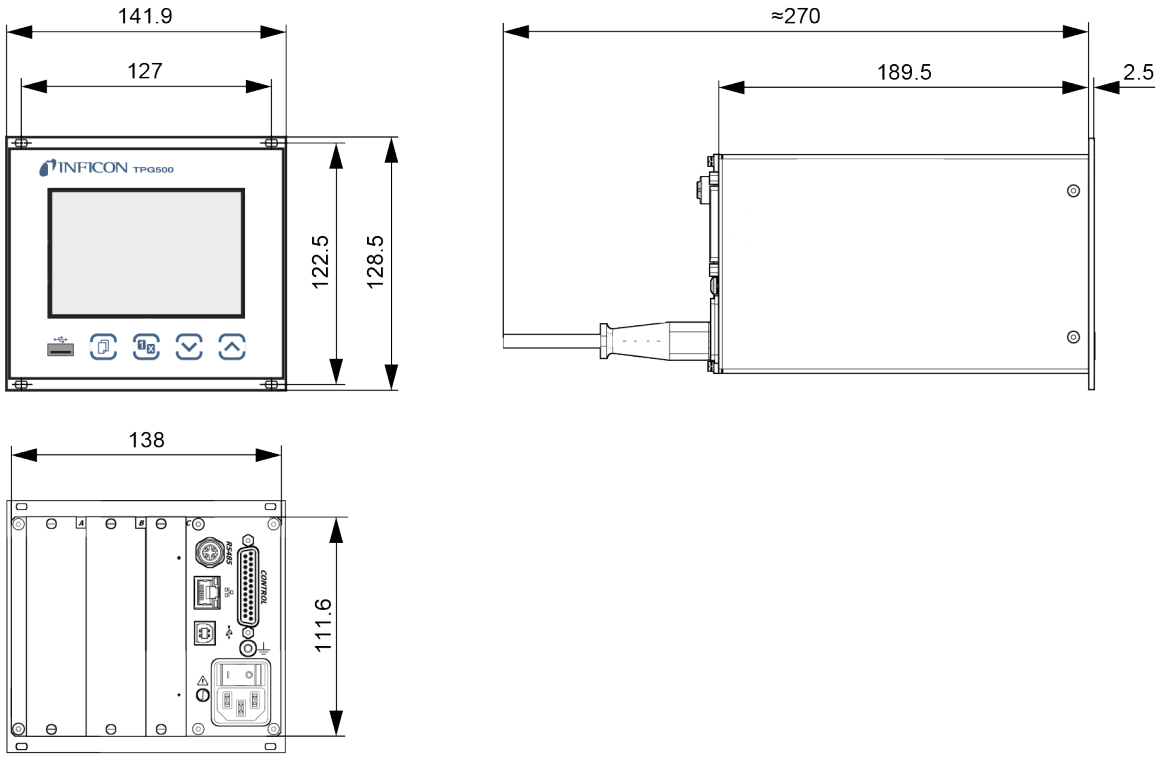
RS232C-interface and relays	Profibus-interface and relays	Profinet interface
IF300A	IF300P IF301P	IF500PN
		

3 Technical Data

Mains specifications	Voltage	100 … 240 V (ac) ±10%
	Frequency	50 … 60 Hz
	Power consumption	≤65 VA
	Overvoltage category	II
	Protection class	1
	Connection	European appliance connector IEC 320 C14
	Fuse	integrated in power supply unit (fuse is not accessible)
Ambience	Ambient temperature	
	Storage	–20 … +60 °C
	Operation	+ 5 … +50 °C
	Relative humidity	≤80% up to +31 °C, decreasing to 50% at +40 °C
	Use	indoors only max. altitude 2000 m
	Pollution degree	II
	Degree of protection	IP30
Slots for plug-in boards	Measurement boards	2 (slot A and B)
	Interface and relay boards	1 (slot C)
Compatible measurement boards	Pirani / cold cathode combined	CP300C9, index B and higher CP300T11, index B and higher CP300T11L, index A and higher
Compatible measurement boards	RS232C interface (D-sub connector) and relays	IF300A
	Profibus interface and relays	IF300P, IF301P
	Profinet interface	IF500PN
Operation	Front panel	via 4 keys
	Remote control	via RS485 interface via USB type B interface via Ethernet interface
Measurement values	Measurement ranges	depending on plug-in boards (→ 🕮 [1])
	Measurement rate analog	≥100 / s
	Display rate	≥10 / s
	Measurement filter	
	Limit frequency	OFF, 100 Hz, 10 Hz (default), 1 Hz, 0.1 Hz
	Measurement unit	hPa, mBar, Torr, Pa, Micron, V, A

Relay contacts	Switching function relays	4
	Error relay	1
	Contact type	floating changeover contact
	Max. load	50 V (ac/dc), 0.5 A
	Contact positions	→ 🗎 16
	Reaction time	≤10 ms
	Allocation of switching points	freely assignable
	Setting range switching points	depending on gauges
	Hysteresis switching points	≥10% of reading
	CONTROL connection	D-sub appliance connector, female, 25-pin (pin assignment → 🗎 16)
Analog outputs	Number	4
	Voltage range	0 … +10 V (dc) ±1% (±0.2% typical) 0 … +5 V (dc)
	Current range	4 … 20 mA ±1% (±0.2% typical)
	Measuring signal vs. pressure	→ 🗎 89
	Resolution	16 Bit
	Output resistance	<50 Ω (typical 47.5 Ω)
	Response time	≤10 ms
	CONTROL connector	D-sub appliance connector, female, 25-pin (pin assignment → 🗎 16)
RS485 interface	Protocol	Mnemonics protocol, ASCII, addressable
	Data format	bi-directional, 1 start bit, 8 data bits, 1 stop bit, no parity bit, no handshake
	Transmission rate (Baud)	9600, 19200, 38400, 57600, 115200
	RS485 connector	Binder M12 appliance connector, 5-pin (pin assignment → 🗎 18)
USB Type A interface	Protocol	FAT file system file handling in ASCII format
USB Type B- interface	Protocol	Mnemonics protocol, ASCII
	Transmission rate (Baud)	9600, 19200, 38400, 57600, 115200
Ethernet interface	Protocol	Mnemonics protocol, ASCII
	Configuration	→ 🗎 99

Dimensions [mm]



Use	For incorporation into a rack or control panel or as a desk-top unit
Weight	<1.45 kg

4 Installation

4.1 Personnel

Skilled personnel

The unit may only be installed by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

4.2 Installation, Setup

The unit is suited for incorporation into a 19" rack or a control panel or for use as a desk-top unit.

DANGER

Putting a product which is visibly damaged into operation can be extremely hazardous. If the product is visibly damaged do not put it into operation and make sure it is not inadvertently put into operation.

4.2.1 Rack Installation

The unit is designed for installation into a 19" rack chassis adapter according to DIN 41 494. For this purpose, four collar screws and plastic sleeves are supplied with it.

DANGER

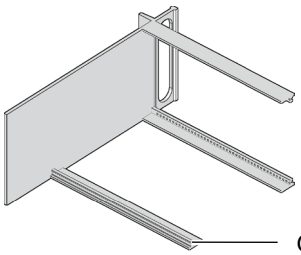
Protection class of the rack

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures for the rack to meet the specifications of the protection class.

Guide rail

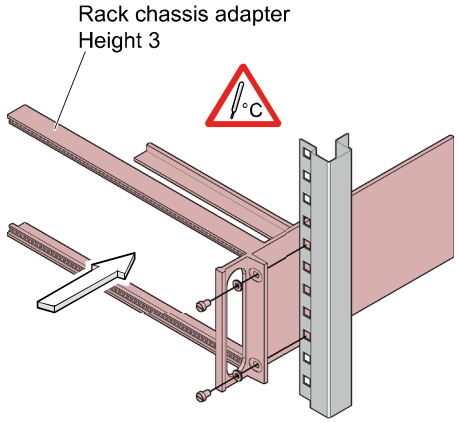
In order to reduce the mechanical strain on the front panel of the TPG500, preferably equip the rack chassis adapter with a guide rail.



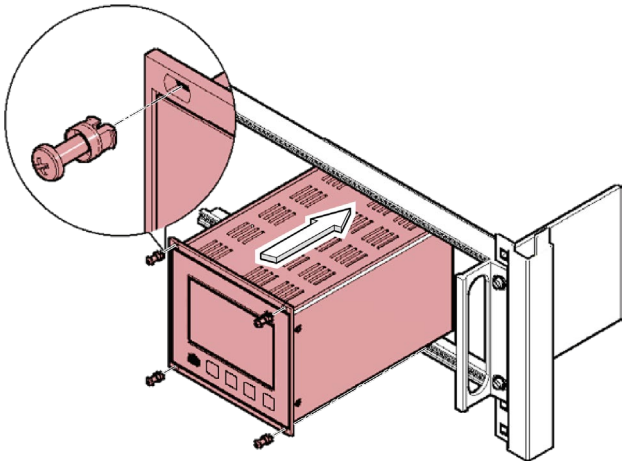
Height 3 rack chassis adapter

❶ Secure the rack adapter in the rack frame.

The maximum admissible ambient temperature (→ 🗎 9) must not be exceeded and the air circulation must not be obstructed.



❷ Slide the TPG500 into the rack chassis adapter …



… and fasten the adapter panel to the rack chassis adapter using the screws supplied with the TPG500.

4.2.2 Installation in a control panel

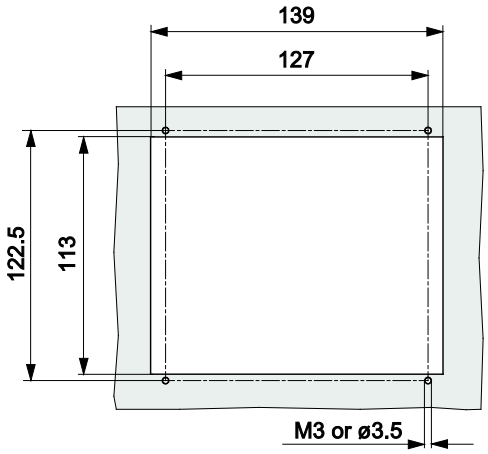
STOP DANGER

Protection class of the rack

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures for the rack to meet the specifications of the protection class.

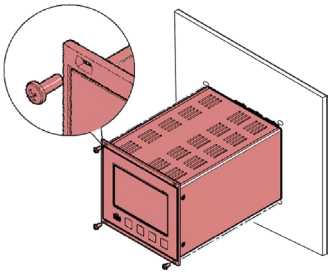
For mounting the TPG500 into a control panel, the following cut-out is required:



The maximum admissible ambient temperature (→ 🗎 9) must not be exceeded and the air circulation must not be obstructed.

For reducing the mechanical strain on the front panel of the TPG500, preferably support the unit.

❶ Slide the TPG500 into the cut-out of the control panel …

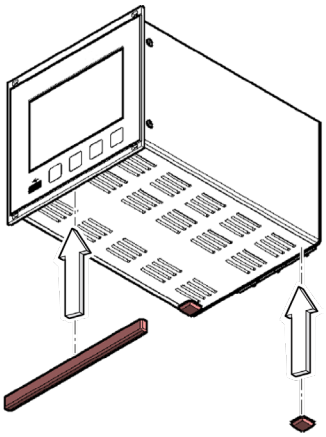


… and secure it with four M3 or equivalent screws.

4.2.3 Use as Desk-Top Unit

The TPG500 may also be used as a desk-top unit. For this purpose, two self-adhesive rubber feet and a slip-on rubber bar are supplied with it.

❶ Stick the two supplied rubber feet to the rear part of the bottom plate …



… and slip the supplied rubber bar onto the bottom edge of the front panel.

Select a location where the admissible maximum ambient temperature (→ 🗎 9) is not exceeded (e.g. due to sun irradiation).

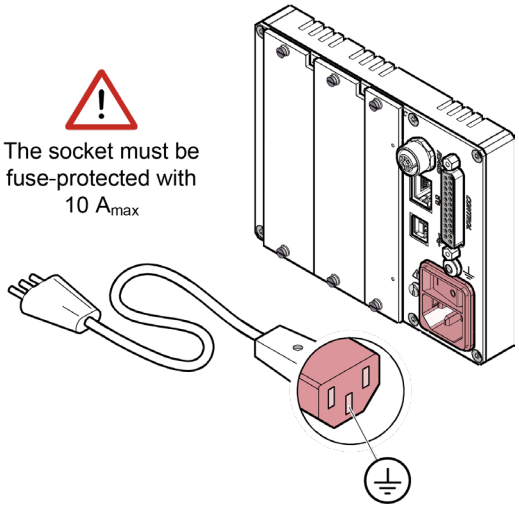
4.3 Mains Power Connector

DANGER

Line voltage

Incorrectly grounded products can be extremely hazardous in the event of a fault.

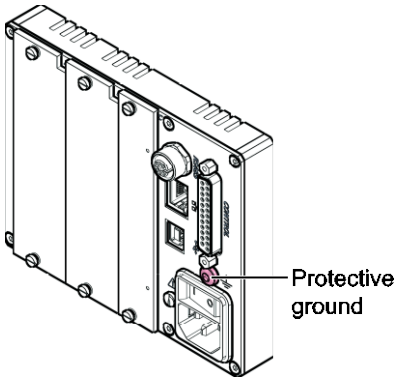
Use only a 3-conductor power cable with protective ground. The mains power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.



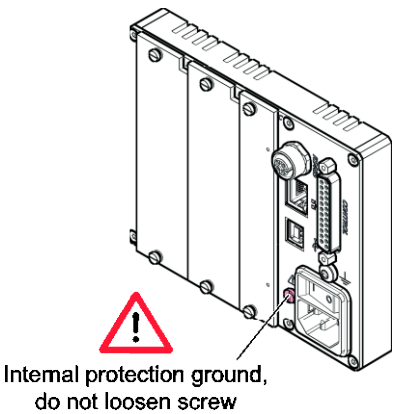
If the unit is installed in a switching cabinet, the mains voltage should be supplied and turned on via a central distributor.

Ground Connection

On the rear of the unit is a screw enabling the TPG500 where necessary to be connected via a ground conductor, e.g. with the protective ground of the pump stand.



Internal protection ground



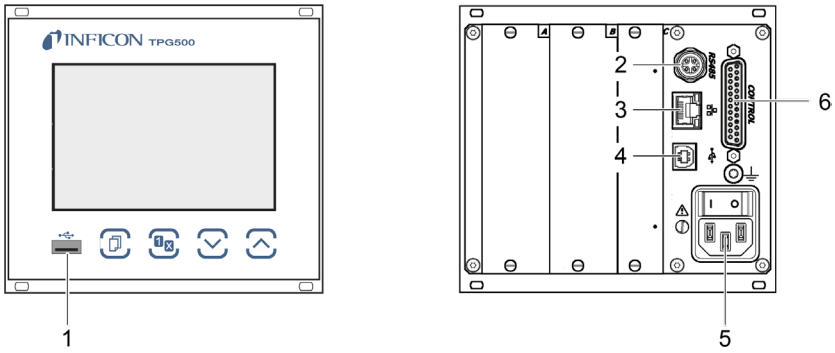
4.4 Installing / Removing plug-in boards

Further information and details on installing/removing plug-in boards and handling of empty slots you find in 🕮 [1].

Connecting plug-in boards

Electrical connections of gauges, analog signals, relays contacts etc. depend on the plug-in boards used and are described in 🕮 [1] in detail.

4.5 Interface Connectors



1	⇐	USB Type A interface	→ 🗎 18
2	*RS485*	RS485 interface	→ 🗎 18
3	品	Ethernet interface	→ 🗎 19
4	⇐	USB Type B interface	→ 🗎 18
5	⚠	3-pin mains power connector	→ 🗎 15
6	*CONTROL*	Relay contacts connector, analog outputs	→ 🗎 16

4.5.1 *CONTROL Connector*

The switching functions and error monitoring influence the position of various relays. You can use the relay contacts for switching via the *CONTROL* connection. The relay contacts are floating contacts.

In addition, the measuring signal can be read out via this connection (relationship measuring signal vs. pressure → 🗎 89) and the status of the error monitoring can be evaluated potential-free.

Connect the peripheral components to the *CONTROL* connector on the rear of the unit using your own, screened (EMC compatibility) cable.

DANGER

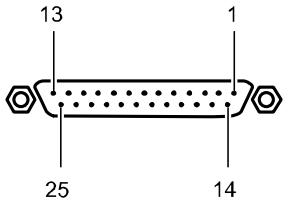
Hazardous voltage

According to EN 61010, voltages exceeding 30 V (ac) or 60 V (dc) are hazardous.

Only connect a protective low voltage.

Pin assignment, contact positions *CONTROL*

Pin assignment of the male 25-pin D-sub appliance connector (female):



Female connector view

Pin	Signal		
	Switching function 1		
8 16 7		Pressure above threshold or power supply turned off	 Pressure bellow threshold
	Switching function 2		
5 13 4		Pressure above threshold or power supply turned off	 Pressure bellow threshold
	Switching function 3		
2 10 1		Pressure above threshold or power supply turned off	 Pressure bellow threshold
	Switching function 4		
15 6 14		Pressure above threshold or power supply turned off	 Pressure bellow threshold
	Error signal		
12 3 11		Error or power supply turned off	 No error
	Supply for relays with higher switching capacity		
9	+24 V (dc), 100 mA	Fuse-protected at 100 mA with PTC element, self-resetting after power off or pulling the *CONTROL* connector. Meets the requirements of a grounded protective extra low voltage.	
17	GND		
18	AGND (analog ground)		
19	Analog Output 1		
20	AGND (analog ground)		
21	Analog Output 2		
22	AGND (analog ground)		
23	Analog Output 3		
24	AGND (analog ground)		
25	Analog Output 4		

4.5.2 Interface Connector *RS485*

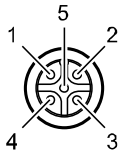
The galvanically isolated RS485 interface enables operation of the TPG500 via a computer or a terminal. Integration into a bus system is possible with the use of a Y distributor.

Connect the serial interface to the *RS485* connector on the rear of the unit using a screened (EMC compatibility) cable.

Pin assignment *RS485*

Pin assignment of the female binder 5-pin M12 appliance connector socket:

Pin	Signal
1	RS485+ (differential)
2	+24 V (dc), ≤200 mA
3	GND
4	RS485- (differential)
5	not assigned



Female connector view

4.5.3 Interface Connector USB Type A

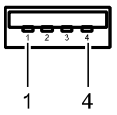
The USB Type A interface connector with master functionality is situated on the front of the unit and is used for the connection of a USB memory stick (e.g. firmware update, parameter saving (read/write), data logger).

Connect the USB memory stick to the connector ⇻ on the front of the unit.

USB type A pin assignment

Pin assignment of the 4-pin USB type A connector socket:

Pin	Signal
1	VBUS (5 V)
2	D-
3	D+
4	GND



Female connector view

4.5.4 Interface Connector USB Type B

The USB Type B interface connector facilitates direct communication with the TPG500 via a computer (e.g. firmware update, parameter saving (read/write)).

Connect the USB interface connector to the ⇻ connector on the rear of the unit using a screened (electromagnetic compatibility) cable.

If a virtual serial interface (COM) is not set up automatically, you can download the driver from "www.ftdichip.com/drivers/vcp-drivers/" and then install it.

Pin assignment USB Type B

Pin assignment of the female 4-pin USB type B connector socket:

Pin	Signal
1	VBUS (5 V)
2	D-
3	D+
4	GND

Female connector view

4.5.5 Interface Connector Ethernet

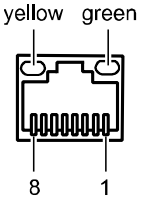
The Ethernet interface allows direct communication with the TPG500 via a computer.

Connect the Ethernet cable to the connector 品 on the rear of the unit.

Pin assignment Ethernet

Pin assignment of the 8-pin RJ45 appliance connector socket:

Pin	Signal
1	TD+ (transmission data +)
2	TD− (transmission data −)
3	RD+ (received data +)
4	n.c.
5	n.c.
6	RD− (received data −)
7	n.c.
8	n.c.



Female connector view

Green LED

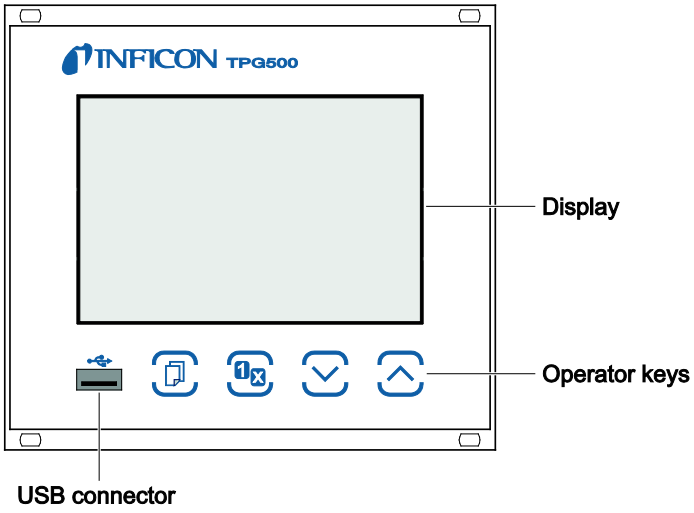
Link or transmit LED. Indicates that a hardware connection has been established.

Yellow LED

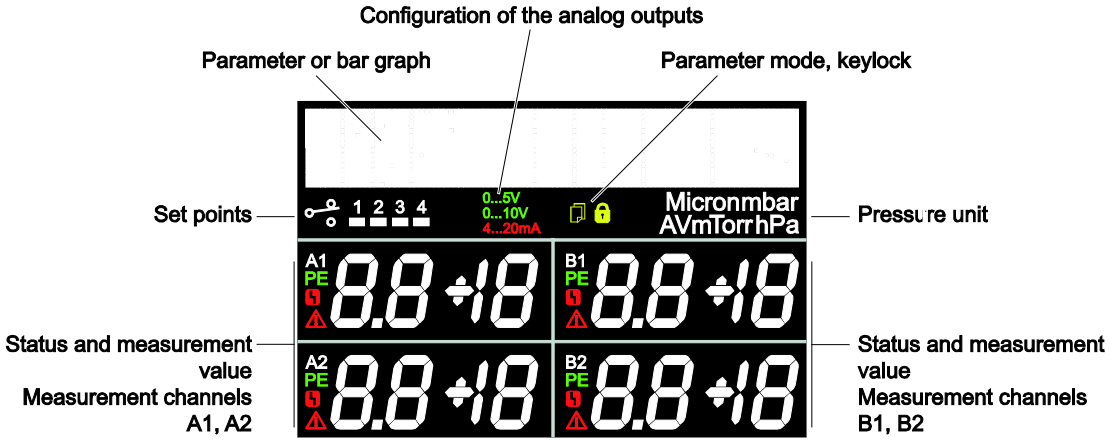
Status or packet-detect LED. Indicates the status of the transmission. Whenever this LED flashes or flickers, this indicates that data is being transmitted.

5 Operation

5.1 Front Panel



Display TPG500



Parameter, bar graph

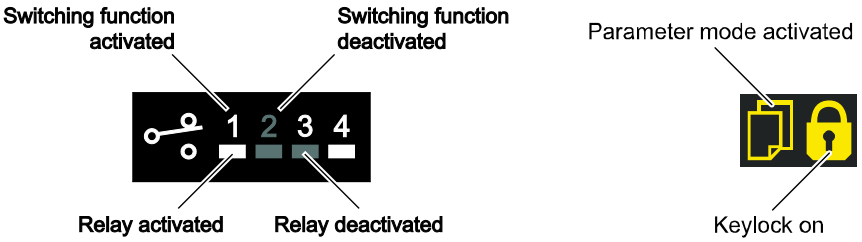
Parameter rows 1 & 2

Bar graph. The symbol of the corresponding measuring channel flashes (e.g. A1).

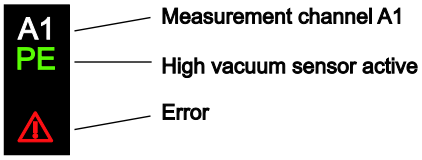
Bar graph with setpoint. The symbol of the corresponding measuring channel flashes (e.g. A1).

Pressure vs. time, trend. The symbol of the corresponding measuring channel flashes (e.g. A1).

Switching points, parameter mode, keylock



Specific measurement channel



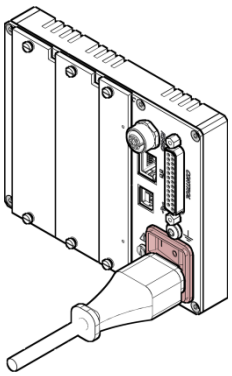
5.2 Switching the TPG500 On and Off

Make sure the unit is correctly installed and the specifications in the Technical Data are met.

Switching on the TPG500

The power switch is on the rear of the unit.

Switch on the TPG500 at the power switch (or, if the unit is incorporated in a rack, switch it on centrally via a switched power distributor).



After power on, the TPG500 …

- automatically performs a self-test
- activates the parameters that were in effect before the last power off
- all measuring circuits with activated hot start (→ 🗎 32) and all operational Pirani gauges are switched on
- the identification of the measuring point is displayed.

Turning the TPG500 off

Turn the TPG500 off with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

Wait at least 10 s before turning the TPG500 on again in order for it to correctly initialize itself.

5.3 Measuring with the TPG500

Gas type dependence

The measured pressure depends on the gas type present. It is referenced to nitrogen (N_2). For other gases please refer to the characteristic curves shown in the appendix of the plug-in card operating manual 🕮 [1].

Validity of displayed data

If you intend to use the measurement results for control functions, allow for the time constants of the TPG500, the gauges, possible ignition delays etc., until valid measurements are displayed (→ 🕮 [2], [3]

Accuracy of measurement

A generally applicable statement on the accuracy of the measurement cannot be made. The type of gas being measured is a major factor affecting the accuracy, and so is the current condition of the gauge.

The accuracy of the gauge at any particular moment can only be assessed by comparing the results with a reference unit. Calibration pumping systems are available for reliable measurements, particularly for pressures under 10^{-4} hPa.

Adjustment

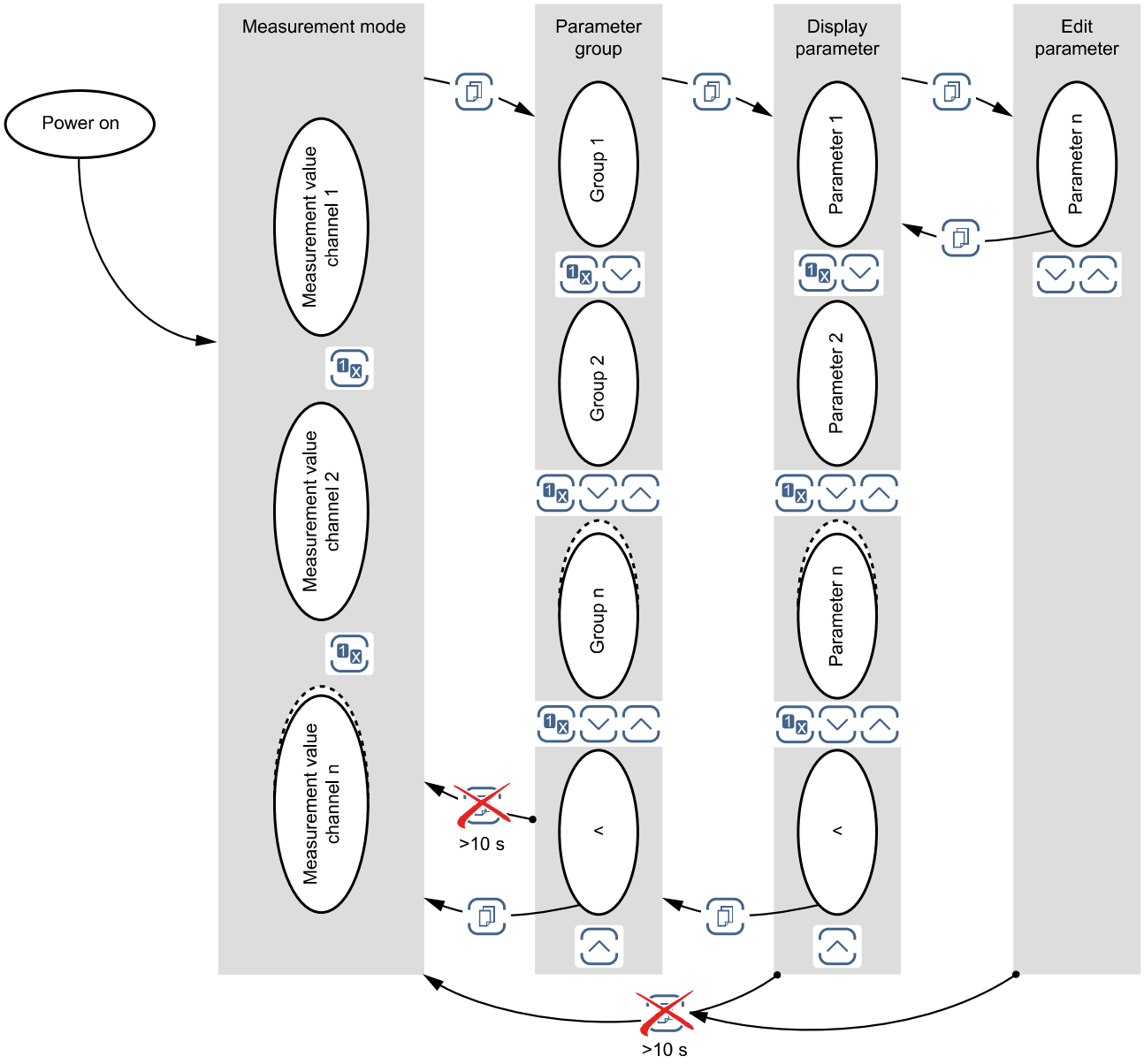
Cold cathode measuring circuits are factory adjusted and require no recalibration.

Pirani measuring circuits are factory adjusted. For accurate measurement → 🕮 [1].

5.4 Operating Modes

The TPG500 works in the following operating modes:

- Measurement mode
  for displaying measurement values or status (→ 🗎 24)
- Parameter mode
  for displaying and editing parameters (→ 🗎 26)
  - Switching function parameter group `SETPOINT >`
    for entering and displaying thresholds (→ 🗎 27)
  - Gauge parameter group `SENSOR >`
    for entering and displaying gauge parameters (→ 🗎 29)
  - Gauge control group `SENSOR-CONTROL >`
    for entering and displaying gauge control parameters (→ 🗎 32)
  - General parameter group `GENERAL >`
    for entering and displaying general parameters (→ 🗎 35)
  - Communication group parameter `COMMUNICATION >`
    for entering and displaying communication parameters (→ 🗎 40)
  - Plug-In Boards parameter group `PLUG-IN BOARDS >`
    for displaying plug-in boards parameters (→ 🗎 42)
  - Data logger mode `DATA LOGGER >`
    for logging measurement data (→ 🗎 43)
  - Program transfer mode `SETUP >`
    for saving (read/write) parameters (→ 🗎 45)
  - Test program group `TEST >`
    for running internal test programs (→ 🗎 47)


Measurement mode
Parameter group
Display parameter
Edit parameter
Power on
Measurement value channel 1
Measurement value channel 2
Measurement value channel n
Group 1
Group 2
Group n
Parameter 1
Parameter 2
Parameter n
<
>10 s
>10 s

5.5 Measurement Mode

Measurement mode is the standard operating mode of the TPG500 with display of

- a bar graph (if required)
- a measurement value for each measurement channel
- status messages for each measurement channel

Adjusting bar graph

If required a bar graph may be displayed (→ 🗎 37).

Changing measurement channel

The unit alternates between the measurement channels. The number of the selected measurement channel flashes.

Switching the gauge on/off

Manual on/off-switching has priority over the automatic control (switch to automatic control → 🗎 32).

The controller does not put Pirani gauges out of operation when switched off, but suppresses the measurement result and the error message.

Switch on cold cathode gauges at pressures <10^{-3} hPa only, in order to prevent excessive contamination of the gauges.

Switching on/off manually

⇨ Press key for >1 s:
Gauge switches on. A measurement value or a status message is displayed.

⇨ Press key for >1 s:
Gauge switches off. The identification of the measuring board is displayed.

Cold cathode measuring circuit 5×10^{-9} hPa

Cold cathode measuring circuit 1×10^{-10} hPa

Cold cathode measuring circuit 1×10^{-11} hPa

Pirani measuring circuit

Pirani measuring circuit for nickel filament

Switching on/off automatically

After switching on a gauge, a measurement value or a status message is displayed.

After switching on a gauge, the identification of the measuring board is displayed.

Cold cathode measuring circuit 5×10^{-9} hPa automatic operation

Cold cathode measuring circuit 1×10^{-10} hPa automatic operation

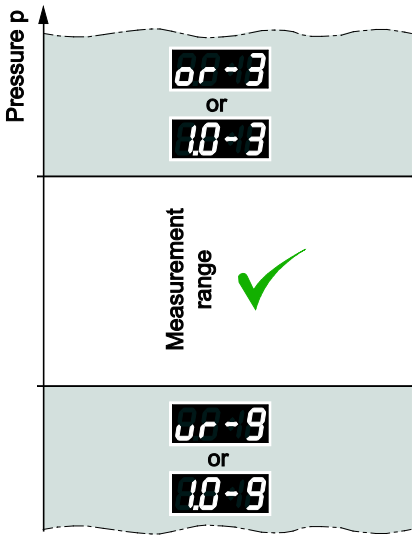
Cold cathode measuring circuit 1×10^{-11} hPa automatic operation

Measured value display

The four measuring channels are displayed simultaneously. The measuring channel symbol of the active measuring channel flashes.

If the measured value of a measuring circuit is outside the measuring range, "or" (overrange) or "ur" (underrange) is displayed, together with the exponent which indicates the range limit.

Instead of "or" and "ur", the respective end value of the measuring range can be displayed (→ Parameter "END VALUE", 🗎 39),



If the upper measuring range limit is exceeded, the cold cathode gauge can become contaminated if it remains switched on.

If the under range control is switched off the system cannot distinguish between a gauge failure, cable interruption and underrange of a cold cathode measuring circuit. "ur" is displayed in all cases.

Displaying the measurement plug-in board identification and gauge type

⇨ Press keys for >0.5 … 1 s:
For the measurement channel in question, the measurement plug-in board identification (row 1) and the gauge type (row 2) are read and displayed for 10 seconds.

Example:		
Row 1	CP300C9	Measurement plug-in board
Row 2	IKR08x	Gauge

Measurement plug-in board (row 1)

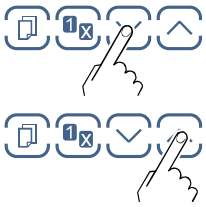
CP300C9	Pirani / cold cathode measurement plug-in board 5×10^{-9} mbar
CP300T11	Pirani / cold cathode measurement plug-in board 1×10^{-11} mbar
CP300T11L	Pirani / cold cathode measurement plug-in board 1×10^{-11} mbar
noIDENT	Plug-in board connected, but not identifiable

5.6 Parameter Mode

The Parameter mode is used for displaying, editing and entering parameter values as well as for testing the TPG500 and for saving measurement data. For ease of operation the individual parameters are divided into groups.

Unit switches from measurement mode to parameter mode. The respective parameter group is displayed in place of the bar graph.

Selecting a parameter group

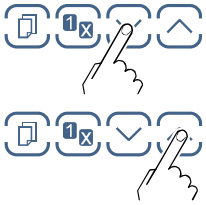


Select group

⇨ Switching function parameters→ 🗎 27
Gauge parameters → 🗎 29
Gauge control → 🗎 32
General parameters → 🗎 35
Communication parameters → 🗎 40
Data logger → 🗎 43
Setup → 🗎 45
Test parameters → 🗎 47

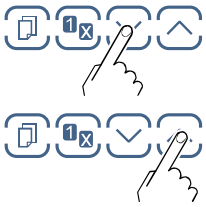
Confirm group

Reading a parameter in a parameter group



Editing and saving a parameter in a parameter group

Confirm the parameter. The value flashes and can now be edited.



Edit the value.

Save the change and return to read mode

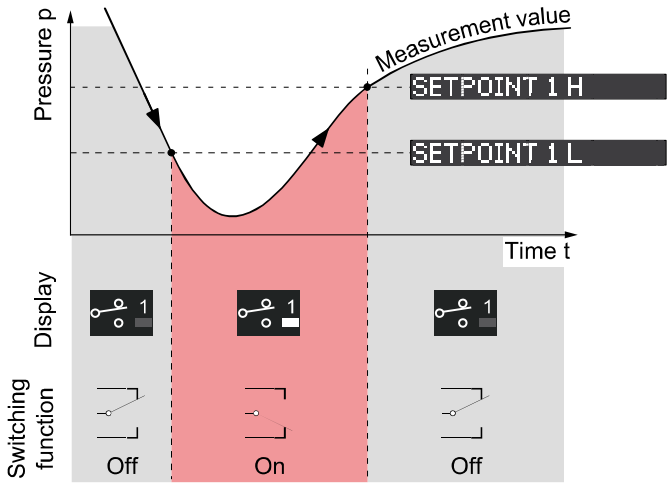
5.6.1 Switching Function Parameters

SETPOINT >	The switching function parameter groups used for displaying, editing and entering threshold values and assigning the six switching functions to a measurement channel.

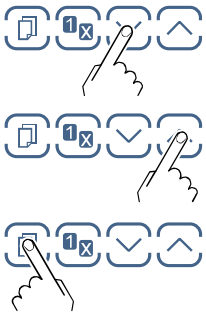
Parameters in this group

SETPOINT 1 CH	Assignment of switching function 1 to a channel
SETPOINT 1 LOW	Switching function 1 lower threshold
SETPOINT 1 HIGH	Switching function 1 upper threshold
SETPOINT 1 ON-T	Delays the switching off of the relay (ON-Timer)
SETPOINT 2 CH	Assignment of switching function 2 to a channel
SETPOINT 2 LOW	Switching function 2 lower threshold
SETPOINT 2 HIGH	Switching function 2 upper threshold
SETPOINT 2 ON-T	Delays the switching off of the relay (ON-Timer)
SETPOINT 3 CH	Assignment of switching function 3 to a channel
SETPOINT 3 LOW	Switching function 3 lower threshold
SETPOINT 3 HIGH	Switching function 3 upper threshold
SETPOINT 3 ON-T	Delays the switching off of the relay (ON-Timer)
SETPOINT 4 CH	Assignment of switching function 4 to a channel
SETPOINT 4 LOW	Switching function 4 lower threshold
SETPOINT 4 HIGH	Switching function 4 upper threshold
SETPOINT 4 ON-T	Delays the switching off of the relay (ON-Timer)
<	One level back

Parallel to the IF30x plug-in boards, the TPG500 has four switching functions with two adjustable thresholds each. The status of the switching functions is displayed on the front panel and can be evaluated via the floating contacts at the *CONTROL* connector (→ 16).



Selecting a parameter

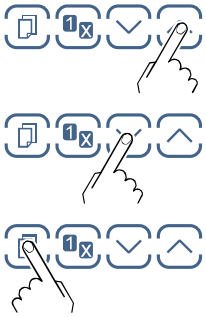


⇨ The name of the parameter and the currently valid parameter value are displayed.

e.g.: `SETPOINT 1 CH`
`DISABLED`
Switching function 1 turned off

⇨ Select parameter. The value flashes and can now be edited.

Editing and saving the parameter



⇨ Press key for <1 s:
The value is increased/decreased by 1 increment.

Press key for >1 s:
The value is increased/decreased continuously.

⇨ Save the change and return to read mode.

We recommend setting the threshold ½ decade above the lower, or ½ decade below the upper, threshold limit.

Assigning a switching function

		Value
Row 1	`SETPOINT 1 CH`	Assignment of a switching function to a measurement channel.
Row 2	`DISABLED`	⇨ Switching function 1 is factory-deactivated
	`ENABLED`	⇨ Switching function 1 is turned on
	`SENSOR A1`	⇨ Switching function 1 is assigned to sensor A1
	`SENSOR A2`	⇨ Switching function 1 is assigned to sensor A2
	`SENSOR B1`	⇨ Switching function 1 is assigned to sensor B1
	`SENSOR B2`	⇨ Switching function 1 is assigned to sensor B2

The lower and the upper threshold of a switching function are always assigned to the same channel. The last assignment is valid for both thresholds.

Limits of the lower switching thresholds

The threshold value can be set in the range 1.0E-11 … 9.9E+3 mbar.

This parameter only appears if a sensor (SENSOR A1, SENSOR A2, SENSOR B1 or SENSOR B2) is assigned to the setpoint.

		Value
Row 1	`SETPOINT 1 LOW`	The lower threshold (Setpoint low) defines the pressure at which the switching function is activated when the pressure is dropping.
Row 2	`1.0E-11`	⇨ Default

The minimum hysteresis between the upper and lower switching threshold amounts to at least 10% of the lower threshold. The upper threshold is if necessary automatically adjusted to a minimum hysteresis. This prevents unstable states.

Limits of the upper switching thresholds

The threshold value can be set in the range 1.0E-11 … 9.9E+3 mbar.

This parameter only appears if a sensor (SENSOR A1, SENSOR A2, SENSOR B1 or SENSOR B2) is assigned to the setpoint.

		Value
Row 1	`SETPOINT 1 HIGH`	The upper switching threshold (Setpoint high) defines the pressure at which the switching function is deactivated when the pressure is rising.
Row 2	`9.0E-11`	⇨ Default

The minimum hysteresis between the upper and lower switching threshold amounts to at least 10% of the lower threshold. This prevents unstable states.

ON-Timer

Entering an ON-Timer value delays the switch-off of the relay. The value can be set in the range 0 … 100 seconds.

If the ON-Timer value is set to 30 seconds, for example, the relay will not be switched off until 30 seconds after SP-H has been exceeded. However, if the measured value returns below SP-L within the 30 seconds, the relay remains activated and the ON-Timer is reset.

		Value
Row 1	`SETPOINT 1 ON-T`	Parameter name
Row 2	`0s`	⇨ 0 seconds (default). Adjustable in the range 0 … 100 seconds

5.6.2 Gauge parameters

`SENSOR >`	The sensor parameter group is used for displaying, entering and editing parameters of the connected gauges.

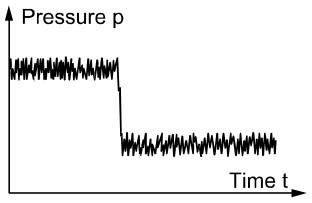
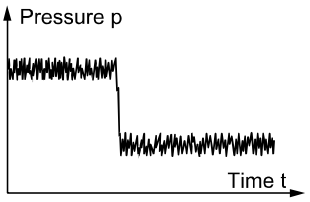
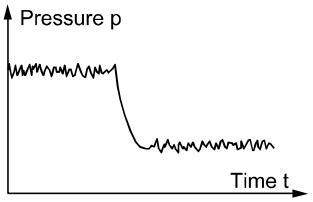
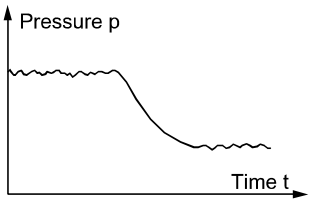
Parameters in this group

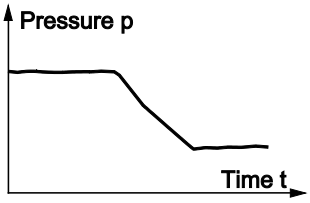
`FILTER`	Measurement value filter.
`GAS TYPE`	Correction factor for other gases.
`CORR-FACTOR`	Correction factor.
`DESIGNATION`	Measuring point name.
`COMPENSATION`	Leakage current compensation.
`<`	One level back.

Measurement value filter

The measurement value filter permits a better evaluation of unstable or disturbed measuring signals.

The measurement value filter does not affect the analog output (→ 🗎 16).

		Value
Row 1	FILTER	Parameter name
Row 2	1 kHz	⇨ OFF The TPG500 responds as quickly as possible to fluctuations in the measurement values. 
	100 Hz	⇨ 100 Hz: The TPG500 responds quickly to fluctuations in the measurement value. As a result, it will respond faster to interference in the measured values. 
	10 Hz	⇨ 10 Hz (default): Good relationship between response and sensitivity of the display and the switching function to changes in the measured values. 
	1 Hz	⇨ 1 Hz: The TPG500 responds slowly to fluctuations in the measurement value. As a result, it will respond slowly to interference in the measured values. 

0.1 Hz	⇨ 0.1 Hz: The TPG500 responds very slowly to fluctuations in the measurement value. As a result, it will respond very slowly to interference in the measured values. 

Correction factor GAS TYPE

The correction factor GAS TYPE allows

- the measurement value to be calibrated to the predefined gas types, or
- the manual input of the correction factor for other gases (CORR-FACTOR).

		Value
Row 1	GAS TYPE	Parameter name
Row 2	NITROGEN/AIR	⇨ Gas type: Nitrogen / air
	HELIUM	⇨ Gas type: Helium
	NEON	⇨ Gas type: Neon
	ARGON	⇨ Gas type: Argon
	KRYPTON	⇨ Gas type: Krypton
	XENON	⇨ Gas type: Xenon
	HYDROGEN	⇨ Gas type: Hydrogen
	CORR-FACTOR	⇨ Manually enter correction factor for other gases via parameter CORR-FACTOR

Correction factor CORR-FACTOR

The correction factor is effective over the entire measuring range and allows the measurement value to be calibrated to other gas types.

Precondition: The GAS TYPE parameter must be set to the CORR-FACTOR value.

		Value
Row 1	CORR-FACTOR	Parameter name
Row 2	1.00	⇨ No correction Adjustable in the range 0.20 … 8.00

Designation

Name of measuring point (8 characters max.).

		Value
Row 1	DESIGNATION	Parameter name
Row 2	FORELINE	⇨ Measuring point name (only capital letters, numbers and underlines permitted). A1 = default for sensor A1)

Leakage current compensation

A leakage current compensation value can be determined automatically for each measuring channel with a cold cathode or set manually via an interface command.

The compensation value is subtracted from the measured pressure value. This enables an automatic correction of pressure values which are falsified by leakage currents caused by long cables.

		Value
Row 1	COMPENSATION	Parameter name
Row 2	OFF	⇨ Compensation disabled
	1.0E-9	⇨ Compensation value (in current pressure unit) Start automatic measurement for leakage current compensation: Press and hold the UP button for ~1s. The text "MEASURING..." is displayed.

5.6.3 Gauge Control

SENSOR-CONTROL >

The sensor control group is used for displaying, entering and editing parameters which define how the connected gauges are activated / deactivated.

Parameters in this group

SENSOR ON	Gauge activation
SENSOR OFF	Gauge deactivation
THRESHOLD ON	ON threshold
THRESHOLD OFF	OFF threshold
<	One level back

General information

- Switching a gauge on/off can be done from different control sources.
- A gauge cannot turn itself on and cannot be turned off by HotStart.
- Pirani gauges remain active after switching off and the display shows "PI" instead of the measurement value. Any cold cathode gauge connected to the same plug-in board will also be switched off.

Gauge activation

Certain gauges can be activated by different means.

The parameter values "SENSOR A1", "SENSOR A2", "SENSOR B1" and "SENSOR B2" are only displayed for the available channels.

		Value
Row 1	SENSOR ON	Parameter name
Row 2	HAND	⇨ Manual activation: The gauge is activated by pressing the key (default).
	HOTSTART	⇨ Hot start: The gauge is automatically activated when the TPG500 is turned on. Measurement is thus automatically resumed after a power failure. Gauge deactivation.
	SENSOR A1	⇨ By measurement channel A1.
	SENSOR A2	⇨ By measurement channel A2.
	SENSOR B1	⇨ By measurement channel B1.
	SENSOR B2	⇨ By measurement channel B2.

HOTSTART + A1	⇨ By hotstart and measurement channel A1: The gauge is automatically activated when the TPG500 is turned on. The switch-on behavior is then controlled by measuring channel A1.
HOTSTART + A2	⇨ By hotstart and measurement channel A2: The gauge is automatically activated when the TPG500 is turned on. The switch-on behavior is then controlled by measuring channel A2.
HOTSTART + B1	⇨ By hotstart and measurement channel B1: The gauge is automatically activated when the TPG500 is turned on. The switch-on behavior is then controlled by measuring channel B1.
HOTSTART + B2	⇨ By hotstart and measurement channel B2: The gauge is automatically activated when the TPG500 is turned on. The switch-on behavior is then controlled by measuring channel B2.
PREVIOUS	⇨ Previous: The gauge is activated by pressing the key. It is started in the same state as before the last power cycle.
PREVIOUS + A1	⇨ Previous and by measurement channel A1: The gauge is started in the same state as before the last power cycle. The switch-on behavior is then controlled by measuring channel A1.
PREVIOUS + A2	⇨ Previous and by measurement channel A2: The gauge is started in the same state as before the last power cycle. The switch-on behavior is then controlled by measuring channel A2.
PREVIOUS + B1	⇨ Previous and by measurement channel B1: The gauge is started in the same state as before the last power cycle. The switch-on behavior is then controlled by measuring channel B1.
PREVIOUS + B2	⇨ Previous and by measurement channel B2: The gauge is started in the same state as before the last power cycle. The switch-on behavior is then controlled by measuring channel B2.

ON threshold

Definition of the ON threshold for the gauge to be activated by a gauge connected to the other measurement channel.

This parameter appears only when the SENSOR ON parameter is set to SENSOR A1, SENSOR A2, SENSOR B1 or SENSOR B2.

You can define a ON threshold with the parameter THRESHOLD ON . If the pressure on the relevant measuring channel falls below the ON threshold, the gauge is switched on.

		Value
Row 1	THRESHOLD ON	Parameter name
Row 2	5.0E-3	ON threshold

Value THRESHOLD OFF must be ≥ THRESHOLD ON .

Gauge deactivation

Certain gauges can be deactivated by different means.

The parameter values "SENSOR A1", "SENSOR A2", "SENSOR B1" and "SENSOR B2" are only displayed for the available channels.

		Value
Row 1	SENSOR OFF	Parameter name
Row 2	HAND	⇨ Manual deactivation: The gauge is deactivated by pressing the key (default).
	SELF	⇨ Self control: The gauge deactivates itself when the pressure rises.
	SENSOR A1	⇨ Automatic deactivation by measurement channel A1.
	SENSOR A2	⇨ Automatic deactivation by measurement channel A2.
	SENSOR B1	⇨ Automatic deactivation by measurement channel B1.
	SENSOR B2	⇨ Automatic deactivation by measurement channel B2.

OFF threshold

Definition of the OFF threshold for the gauge to be deactivated by a gauge connected to the other measurement channel or by itself.

This parameter appears only when the SENSOR OFF parameter is set to SELF, SENSOR A1, SENSOR A2, SENSOR B1, SENSOR B2, HOTSTART + A1, HOTSTART + A2, HOTSTART + B1 or HOTSTART + B2.

You can define an OFF threshold with the parameter THRESHOLD OFF . If the pressure on the relevant measuring channel exceeds the OFF threshold, the gauge is switched off.

		Value
Row 1	THRESHOLD OFF	Parameter name
Row 2	6.0E-3	OFF threshold

Value THRESHOLD OFF must be ≥ THRESHOLD ON .

5.6.4 General Parameters

GENERAL >

The General parameters group is used for displaying, entering and editing generally applicable system parameters.

Parameters in this group

UNIT	Measurement unit
ANALOG OUTPUT	Analog output
ERROR-RELAY	Error relay
PENNING-UR	Penning underrange
BARGRAPH / GRAPH	Bar graph display
CONTRAST LCD	Contrast adjustment
BACKLIGHT	Backlight
SCREENSAVER	Screensaver
SET DEFAULT	Factory settings
LANGUAGE	Language
END VALUE	Display of measurement range end value
<	One level back

Measurement unit

Unit of measured values, thresholds etc. See Appendix for conversion table (→ 🗎 88).

		Value
Row 1	UNIT	Parameter name
Row 2	HPASCAL	⇨ hPa
	MBAR	⇨ mBar (default)
	TORR	⇨ Torr (only available if Torr lock is not activated → 🗎 48)
	PASCAL	⇨ Pa
	MICRON	⇨ Micron (= 0.001 Torr) (only available if Torr lock is not activated → 🗎 48)
	VOLT	⇨ Volt
	AMPERE	⇨ Ampere

Analog output

Output characteristics of the 4 analog outputs.

		Value
Row 1	ANALOG OUTPUT	Parameter name
Row 2	OFF	⇨ Turned off (default)
	0...5V	⇨ 0 … 5 V Direct output of the measuring signals as fast as possible.
	0...10V	⇨ 0 … 10 V Output of measurement signals scaled and filtered to 0 … 10 V.
	4...20mA	⇨ 4 … 20 mA Output of measurement signals scaled and filtered to 4 … 20 mA.

Error relay

Switching behaviour of the error relay.

		Value
Row 1	`ERROR-RELAY`	Parameter name
Row 2	`ALL ERRORS`	⇨ Switches for all errors (factory setting)
	`no SENSOR ERRORS`	⇨ Only unit errors
	`SENSOR A1 ERRORS`	⇨ Error sensor A1 and unit error
	`SENSOR A2 ERRORS`	⇨ Error sensor A2 and unit error
	`SENSOR B1 ERRORS`	⇨ Error sensor A1 and unit error
	`SENSOR B2 ERRORS`	⇨ Error sensor A2 and unit error

Underrange control

Definition of behaviour in the event of an underrange with Cold Cathode Gauges (Penning underrange control).

There are a number of possible causes of an underrange:

- the pressure in the vacuum system is lower than the measurement range
- the measurement element has not (yet) ignited.
- discharge has failed
- a fault has occurred

Caution

Relay is switching

An underrange can lead to unintended reactions of the connected control system.

Prevent false control signals and messages by disconnecting the sensor and control cables.

		Value
Row 1	`PENNING-UR`	Parameter name
Row 2	`DISABLED`	⇨ Factory setting. Underrange state is interpreted as an admissible measurement value. UR is displayed. The switching function remains ON.
	`ENABLED`	⇨ Underrange state is interpreted as an admissible measurement value. UR is displayed. The switching function remains OFF.

If there is a possibility of the pressure in the vacuum system dropping below the measurement range of the gauge, it is advisable to select `PENNING-UR DISABLED`.

If `PENNING-UR ENABLED` is selected, evaluation of the switching function is suppressed for 10 seconds when the gauge is turned on and each time after an underrange has recurred. During this time, the switching function remains OFF.

Cold cathode measuring circuits for 10^{-11} mbar sometimes require more than 10 seconds for the transition OR to UR and thus lead the switching function being ON for a short time.

Bar graph

In the dot matrix a bar graph or the measured pressure as a function of time ($p = f_{(t)}$) may be shown.

During parameter setting the parameter and the parameter value may be displayed in place of this.

		Value
Row 1	BARGRAPH	Parameter name
Row 2	OFF	⇨ Factory setting.
	FULLSCALE	⇨ Bar graph covering full scale range.
	FULLSCALE h	⇨ Bar graph covering full scale range, high-level presentation.
	FULLSCALE+SP	⇨ Bar graph covering full scale range and setpoint threshold.
	DECADE	⇨ Bar graph covering a decade according to current measurement value.
	DECADE h	⇨ Bar graph covering a decade according to current measurement value, high-level presentation.
	DECADE+SP	⇨ Bar graph covering a decade according to current measurement value and setpoint threshold.
	f(0.2s)	⇨ $p = f_{(t)}$, autoscaled, 0.2 seconds / pixel For each measurement, a measurement value is saved in tabular form every 200 ms and the last 100 measurement values (=100 pixel) are shown autoscaled. The represented data string corresponds to a logging duration of 20 seconds.
	f(1s)	⇨ $p = f_{(t)}$, autoscaled, 1 second / pixel For each measurement, a measurement value is saved in tabular form every second and the last 100 measurement values (=100 pixel) are shown autoscaled. The represented data string corresponds to a logging duration of 100 seconds.
	f(6s)	⇨ $p = f_{(t)}$, autoscaled, 6 seconds / pixel For each measurement, a measurement value is saved in tabular form every 6 seconds and the last 100 measurement values (=100 pixel) are shown autoscaled. The represented data string corresponds to a logging duration of 10 minutes.
	f(1min)	⇨ $p = f_{(t)}$, autoscaled, 1 minute / pixel For each measurement, a measurement value is saved in tabular form every minute and the last 100 measurement values (=100 pixel) are shown autoscaled. The represented data string corresponds to a logging duration of 100 minutes.
	f(0.5h)	⇨ $p = f_{(t)}$, autoscaled, 30 minutes / pixel For each measurement, a measurement value is saved in tabular form every 30 minutes and the last 100 measurement values (=100 pixel) are shown autoscaled. The represented data string corresponds to a logging duration of 50 hours.

IDENTIFICATION	⇨ For the selected measurement circuit, the plug-in board identification (row 1) and the measuring point name (row 2) are displayed. e.g.: CP300C9 FORELINE
SETPOINTS	⇨ For the selected measurement channel the measuring point name (row 1) and the assigned setpoints (row 2) are displayed. e.g.: FORELINE SP 2,4

Contrast

		Value
Row 1	CONTRAST LCD	Parameter name
Row 2	0%	⇨ Off
	⋮	Default = 40%
	100%	⇨ Full contrast

Backlight

		Value
Row 1	BACKLIGHT	Parameter name
Row 2	0%	⇨ Off
	⋮	Default = 40%
	100%	⇨ Full brightness

Screensaver

		Value
Row 1	SCREENSAVER	Parameter name
Row 2	OFF	⇨ Factory setting
	10 MINUTES	⇨ After 10 minutes
	30 MINUTES	⇨ After 30 minutes
	1 HOUR	⇨ After 1 hour
	2 HOURS	⇨ After 2 hours
	8 HOURS	⇨ After 8 hours
	DARKROOM	⇨ The backlight is switched off completely after 1 minute. It is activated again by pressing any key.

Default parameter settings

All user parameter settings are replaced by the default values (factory settings).

Caution

Interruption of the current connection

Resetting the parameters to factory settings also resets communication parameters (e.g. transmission rate, Ethernet settings) and can lead to an interruption of the current connection.

Reset parameter to factory setting only if you are sure that no malfunction will cause by an interruption of the current connection.

Loading of the default parameter settings is irreversible.

		Value
Row 1	SET DEFAULT	Parameter name
Row 2	▼+▲ 2s	Press ▽△ keys at the same time for >2 s to start loading default values
	DEFAULTS LOADED	⇨ The default values are loaded (displayed in the default language)

Language

Display language.

		Value
Row 1	LANGUAGE	Parameter name
Row 2	ENGLISH	⇨ English (default)
	GERMAN	⇨ German
	FRENCH	⇨ French

Display of measurement range end value

Display of underrange or overrange.

		Value
Row 1	END VALUE	Parameter name
Row 2	UR/OR	⇨ When an underrange or overrange occurs UR or OR is displayed (default)
	VALUE	⇨ When an underrange or overrange occurs the respective full scale value is displayed

5.6.5 Communication Parameters

COMMUNICATION >	The Communication parameters group is used for displaying, entering and editing communication parameters.

Parameters in this group

BAUDRATE USB	Transmission rate USB interface
BAUDRATE IFxxx	Transmission rate IF30x plug-in board
BAUDRATE RS485	Transmission rate RS485 interface
RS485 ADRESSE	RS485 device address
DHCP (ETH)	Dynamic Host Configuration Protocol (Ethernet)
IP (ETH)	IP address (Ethernet)
SUBNET (ETH)	Subnet mask (Ethernet)
GATEWAY (ETH)	Gateway address (Ethernet)
<	One level back

Transmission rate USB interface

Transmission rate of the USB interface.

		Value
Row 1	BAUDRATE USB	Parameter name
Row 2	9600	⇨ 9600 Baud
	19200	⇨ 19200 Baud
	38400	⇨ 38400 Baud
	57600	⇨ 57600 Baud
	115200	⇨ 115200 Baud (default)

Transmission rate IF30x plug-in board

Transmission rate of the IF30x plug-in board.

If the TPG500 is operated with the IF30xP Profibus interface plug-in board, the transmission rate must be set to 19200 Baud.

If the TPG500 is operated with the IF500PN Profinet interface plug-in board, the transmission rate is set to 115200 Baud automatically. This transmission rate cannot be changed and AUTO appears in row 2.

		Value
Row 1	BAUDRATE IFxxx	Parameter name
Row 2	AUTO	⇨ Transmission rate set automatically
	1200	⇨ 1200 Baud
	2400	⇨ 2400 Baud
	4800	⇨ 4800 Baud
	9600	⇨ 9600 Baud (default)
	19200	⇨ 19200 Baud

Transmission rate RS485 interface

Transmission rate of the RS485 interface.

		Value
Row 1	BAUDRATE RS485	Parameter name
Row 2	9600	⇨ 9600 Baud
	19200	⇨ 19200 Baud
	38400	⇨ 38400 Baud
	57600	⇨ 57600 Baud
	115200	⇨ 115200 Baud (default)

RS485 address

RS485 device address.

		Value
Row 1	RS485 ADDRESS	Parameter name
Row 2	1	⇨ Default
	⋮	Adjustable from 1 … 24
	24	

DHCP

Dynamic Host Configuration Protocol. Allows the automatic allocation of the network configuration (IP address, subnet mask, gateway) to clients through the server.

		Value
Row 1	DHCP (ETH)	Parameter name
Row 2	OFF	⇨ The IP address, subnet mask, and gateway must be configured manually (factory setting)
	ON	⇨ The IP address, subnet mask, and gateway are set automatically, but cannot be changed.

IP address

IP address.

		Value
Row 1	IP (ETH)	Parameter name
Row 2	xxx.xxx.xxx.xxx	⇨ Can only be changed if DHCP is set to "OFF".

Subnet mask

Subnet mask.

		Value
Row 1	SUBNET (ETH)	Parameter name
Row 2	xxx.xxx.xxx.xxx	⇨ Can only be changed if DHCP is set to "OFF".

Gateway address

Gateway address.

		Value
Row 1	GATEWAY (ETH)	Parameter name
Row 2	xxx.xxx.xxx.xxx	⇨ Can only be changed if DHCP is set to "OFF".

5.6.6 Plug-In Boards Parameters

PLUG-IN BOARDS >

The Plug-In Boards parameters group is used for displaying plug-in boards parameters.

Parameters in this group

IDENTIFICATION	Identification of the plug-in board
HARDWARE VERSION	Hardware version of the plug-in board
SOFTWARE VERSION	Software version of the plug-in board
SOFTWARE UPDATE	Software update of the plug-in board
<	One level back

Identification

		Value
Row 1	IDENTIFIKATION	Identification of the plug-in board
Row 2	IF500PN	⇨ Type of the plug-in board

Hardware version

		Value
Row 1	HARDWARE VERSION	Hardware version of the plug-in board
Row 2	V1.00	⇨ Display of the hardware version for plug-in boards of the latest generation
	-	⇨ For plug-in boards of the old generation the hardware version is not displayed

Software version

		Value
Row 1	SOFTWARE VERSION	Software version of the plug-in board
Row 2	V1.00	⇨ Display of the software version for plug-in boards of the latest generation
	-	⇨ For plug-in boards of the old generation the software version is not displayed

Software update

		Value
Row 1	SOFTWARE UPDATE	Software update of the plug-in board via USB stick
Row 2	\/+/\2s	⇨ Update of the software only for plug-in boards of the latest generation

5.6.7 Data Logger Mode

DATA LOGGER >

The data logger group is used for

- recording measurement data on a USB memory stick (interface type A on the front of the TPG500)
- deleting recorded measurement data from the USB memory stick

This group is only available when a USB memory stick formatted for the FAT file system (FAT32) is plugged in. Use a max. 32 GB memory stick.

Not all USB memory sticks are automatically recognized by the TPG500, as they (in particular cheaper brands) do not always conform to USB standard requirements. Try a different memory stick before contacting your nearest INFICON service center.

Parameters in this group

MODUS	Start of data recording
DATE	Current date
TIME	Current time
INTERVAL	Recording interval
DEC-SEPARATOR	Decimal separator
FILENAME	File name
START / STOP	Start / stop display
CLEAR	Deletion of files with displayed measurement data

Modus

		Value
Row 1	MODUS	Recording mode
Row 2	MANUELL	⇨ Manual start via START / STOP (default)
Row 2	AUTOMATISCH	⇨ Automatic start by inserting a USB memory stick. Disconnect the USB memory stick to stop the recording, or use parameter ▼ TO STOP .

Date

		Value
Row 1	DATE	Current date in the format YYYY-MM-DD
Row 2	2020-04-25	⇨ e.g. 2020-04-25

Time

		Value
Row 1	TIME	Current time in the format hh:mm [24 h]
Row 2	15:45	⇨ e.g. 15:45

Interval

Data logging interval.

		Value
Row 1	INTERVAL	
Row 2	1s	⇨ Recording interval 1/s
	10s	⇨ Recording interval 1/10 s
	30s	⇨ Recording interval 1/30 s
	1min	⇨ Recording interval 1/60 s
	1% DEVIATION	⇨ Recording interval: In the event of measurement value changes ≥1%
	5% DEVIATION	⇨ Recording interval: In the event of measurement value changes ≥5%

Decimal separator

Decimal separator for measurement values in the measurement data file.

Further processing of recorded data (e.g. with Excel): Pay attention to the corresponding decimal separator (comma or dot).

		Wert
Row 1	DEC-SEPARATOR	
Row 2	, (COMMA)	⇨ Decimal comma
	. (DOT)	⇨ Decimal point

File name

		Value
Row 1	FILENAME	Name of the measurement data file, max. 7 digits
Row 2	DATALOG	⇨ File ending: CSV

After entering the 7th digit the display stops flashing. The name of the data file is saved and the unit is in the read mode again.

Is the file name shorter than 7 digits, a blank space must be set to each remaining digit.

Start / Stop

Starting / stopping measurement value record.

The symbol flashes during measurement data record.

		Value
Row 1	START/STOP	
Row 2	▲ TO START	⇨ Press key to start data record: Data record is running, display has changed to ▼ TO STOP and the symbol is blinking.
	▼ TO STOP	⇨ Press key to stop data record: Data record is stopped, display has changed to ▲ TO START and the symbol is blinking.

Delete

For deleting all measurement data files (extension CSV) from the USB memory stick.

		Value
Row 1	CLEAR	
Row 2	▼+▲	Press ▽△ keys at the same time to delete files
	RUNNING	⇨ CSV files are being deleted
	DONE	⇨ CSV files have been deleted

5.6.8 Setup Mode

SETUP >

This group is used for

- saving all parameters on a USB memory stick (interface type A on the front of the TPG500)
- loading all parameters from a USB memory stick onto the TPG500
- formatting a USB memory stick
- deleting files with saved parameters from the USB memory stick

This group is only available when a USB memory stick formatted for the FAT file system (FAT32) is plugged in. Use a max. 32 GB memory stick.

Parameters in this group

SAVE TO	Saving all parameters
RESTORE FROM	Loading all parameters onto the TPG500
FORMAT	Formatting USB memory stick (FAT32)
CLEAR	Deletion of files with saved parameters
<	One level back

Saving a parameter

Saving all parameters of the TPG500 to a USB memory stick (file ending: CSV).

The threshold values and the offset are saved in mBar or hPa.

		Value
Row 1	SAVE TO	
Row 2	SETUP00.CSV	⇨ File name on the USB memory stick: SETUP00.CSV
	⋮	
	SETUP99.CSV	⇨ File name on the USB memory stick: SETUP99.CSV
	RUNNING	⇨ CSV file is being saved
	DONE	⇨ Saving completed

Loading a parameter

Loading all parameters from a USB memory stick onto the TPG500.

		Value
Row 1	RESTORE FROM	
Row 2	SETUP00.CSV	⇨ File name on the USB memory stick: SETUP00.CSV
	⋮	
	SETUP99.CSV	⇨ File name on the USB memory stick: SETUP99.CSV
	RUNNING	⇨ CSV file is being loaded
	DONE	⇨ Loading completed
	ERROR	⇨ Error occurred

Formatting

Formatting USB memory stick.

		Value
Row 1	FORMAT	
Row 2	▼+▲	Press ▽△ keys at the same time to start formatting
	RUNNING	⇨ Formatting in progress
	DONE	⇨ Formatting completed

Delete

Deleting all parameter files (ending CSV) from the USB memory stick.

		Value
Row 1	CLEAR	
Row 2	▼+▲	Press ▽△ keys at the same time to delete files
	RUNNING	⇨ CSV files are being deleted
	DONE	⇨ CSV files have been deleted

5.6.9 Test Parameters

TEST >

The Test parameter group is used for displaying the firmware version, entering and editing special parameter values, and for running test programs.

The group is only available if

- the key was pressed while the unit was turned on, or
- the key was pressed for 5 s while < is displayed.

Parameters in this group

SOFTWARE VERSION	Firmware version
HARDWARE VERSION	Hardware version
MAC ADDRESS	MAC address
RUNHOURS	Operating hours
WATCHDOG	Watchdog control
TORR-LOCK	Torr lock
KEY-LOCK	Keylock
FLASH TEST	FLASH test (program memory)
EEPROM TEST	EEPROM test (parameter memory)
DISPLAY TEST	Display test
RELAY TEST	Relay test
RECALIBRATION	Re-calibration
<	One level back

The parameters in this group are available for all gauges.

Firmware version

The firmware version (program version) is displayed.

		Version
Row 1	SOFTWARE VERSION	This information is helpful when contacting INFICON
Row 2	1.30 [xxxx]	

Hardware version

The hardware version is displayed.

		Version
Row 1	HARDWARE VERSION	This information is helpful when contacting INFICON
Row 2	1.00	

MAC address

The MAC address is displayed.

		Value
Row 1	MAC ADDRESS	The address is displayed without any separators (e.g. 00-A0-41-0A-00-08)
Row 2	00A0410A0008	

Operating hours

The operating hours are displayed.

		Value
Row 1	RUNHOURS	⇨ Operating hours
Row 2	24 h	

Watchdog control

Behaviour of the system control (watchdog control) in the event of an error.

		Setting
Row 1	WATCHDOG	
Row 2	AUTO	⇨ The system automatically acknowledges error messages of the watchdog after 2 s (factory setting)
	OFF	⇨ Error messages of the watchdog have to be acknowledged by the operator

Torr lock

The measurement unit Torr can be suppressed in the corresponding parameter setting (→ 🗎 35).

		Setting
Row 1	TORR-LOCK	
Row 2	OFF	⇨ Measurement unit Torr available (factory setting)
	ON	⇨ Measurement unit Torr not available

Keylock

The keylock function prevents inadvertent entries in the parameter mode and thus malfunctions.

		Setting
Row 1	KEY-LOCK	
Row 2	OFF	⇨ Keylock function disabled (factory setting)
	ON	⇨ Keylock function enabled

FLASH test

Test of the program memory.

		Test sequence
Row 1	FLASH TEST	
Row 2	▼+▲	Press ▽△ keys at the same time to start test
	RUN	⇨ Test in progress (very briefly)
	PASS	⇨ Test completed, no error found. After the test, an 8-digit checksum (e.g. 0x12345678) is displayed.
	ERROR	⇨ Test completed, error found. After the test, an 8-digit checksum (e.g. 0x12345678) is displayed. If the error persists after repeating the test, please contact your nearest INFICON service center.

EEPROM test

Test of the parameter memory.

	Test sequence
Row 1 `EEPROM TEST`	
Row 2 `▼+▲`	Press ▼▲ keys at the same time to start test
`RUN`	⇨ Test in progress.
`PASS`	⇨ Test completed, no error found.
`ERROR`	⇨ Test completed, error found. If the error persists after repeating the test, please contact your nearest INFICON service center.

Display test

Test of the display.

	Test sequence
Row 1 `DISPLAY TEST`	
Row 2 `▼+▲`	Press ▼▲ keys at the same time to start test
	⇨ After starting the test, all display elements are lit at the same time for 10 s.

Relay test

Test of the unit relays. The test program tests their switching function.

Caution

The relays switch irrespective of the pressure.

Starting a test program may cause unwanted effects in connected control systems.

Disconnect all sensor and control system lines to ensure that no control commands or messages are triggered by mistake.

The relays switch on and off cyclically. The switching operations are indicated optically and are also clearly audible.

The switching function contacts are connected to the *control* connector on the rear of the unit (→ 16). Check their function with an ohmmeter.

		Test sequence
Row 1	RELAY TEST	
Row 2	▼+▲	Press keys at the same time to start test
	OFF	⇨ All relays deactivated
	REL1 ON	⇨ Switching function relay 1
	REL1 OFF	⇨ Switching function relay 1
	REL2 ON	⇨ Switching function relay 2
	REL2 OFF	⇨ Switching function relay 2
	⋮	

Re-calibration

Date of the next re-calibration.

		Test sequence
Row 1	RECALIBRATION	
Row 2	2020-12-01	Date of the next re-calibration

Once the configured date is reached, the following information message will be displayed periodically.

Row 1	RECALIBRATION
Row 2	REQUIRED !

6 Communication Protocol (Serial Interface)

The serial interfaces (RS485, USB, Ethernet, IF300A) are used for communication between the TPG500 and a computer. A terminal can be connected for test purposes.

RS232C interface

RS232C communication requires one of the interface and relay cards provided for the TPG500 (IF300A → 🕮 [1]).

Profibus interface

The TPG500 can be equipped with a Profibus interface. This requires the corresponding interface relay card IF30xP in slot C of the TPG500. This card has the standard Profibus interface and five relay outputs (switching functions and error status).

Description of the function and programming instructions → 🕮 [1], [4].

Profinet interface

The TPG500 can be equipped with a Profinet interface. This requires the corresponding interface relay card IF500PN in slot C of the TPG500. This card has the standard Profinet interface.

Description of the function and programming instructions → 🕮 [1], [5].

It should be noted that for commands containing channel-specific parameters, the number of values must match the number of channels.

Example: Transmit: **FIL** [,a,b,c,d]

6.1 Data Transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

Data format

1 start bit, 8 data bits, no parity bit, 1 stop bit, no hardware handshake

Definitions

The following abbreviations and symbols are used:

Symbol	Meaning	Dez	Hex
HOST	Computer or terminal		
[...]	Optional elements		
ASCII	American Standard Code for Information Interchange		
<ETX>	END OF TEXT (CTRL C) Reset the interface	3	03
<CR>	CARRIAGE RETURN Go to beginning of line	13	0D
<LF>	LINE FEED Advance by one line	10	0A
<ENQ>	ENQUIRY Request for data transmission	5	05
<ACK>	ACKNOWLEDGE Positive report signal	6	06
<NAK>	NEGATIVE ACKNOWLEDGE Negative report signal	21	15
<ESC>	ESCAPE	27	1B

"Transmit": Data transfer from HOST to TPG500
"Receive": Data transfer from TPG500 to HOST

Flow Control

After each ASCII string, the HOST must wait for a report signal (<ACK><CR><LF> or <NAK> <CR><LF>).

The input buffer of the HOST must have a capacity of at least 64 bytes.

6.2 Communication Protocol

Transmission format

Messages are transmitted to the TPG500 as ASCII strings in the form of mnemonic operating codes and parameters. All mnemonics comprise three ASCII characters.

Spaces are ignored. <ETX> (CTRL C) clears the input buffer in the TPG500.

With RS485 half-duplex connection no LINE FEED (<LF>) should be sent (data collision on the bus).

The use of LINE FEED is generally permitted with the other interfaces (USB, Ethernet, IF300A). For time reasons, however, it should not be used.

Transmission protocol

HOST	TPG500	Explanation
Mnemonics [and parameters] ——————>		Receives message with "end of message"
<CR>[<LF>] ——————————————>		
<——————————————	<ACK><CR><LF>	Positive acknowledgment of a received message

Reception format

When requested with a mnemonic instruction, the TPG500 transmits the measurement data or parameters as ASCII strings to the HOST.

<ENQ> must be transmitted to request the transmission of an ASCII string. Additional strings, according to the last selected mnemonic, are read out by repetitive transmission of <ENQ>.

If <ENQ> is received without a valid request, the ERROR word is transmitted.

Reception protocol

HOST	TPG500	Explanation
Mnemonics [and parameters] ——————>		Receives message with "end of message"
<CR>[<LF>] ——————————————>		
<——————————————	<ACK><CR><LF>	Positive acknowledgment of a received message
<ENQ> ——————————————>		Requests to transmit data
<——————————	Measurement values or parameters	Transmits data with "end of message"
<——————————————	<CR><LF>	
:		:
<ENQ> ——————————————>		Requests to transmit data
<——————————	Measurement values or parameters	Transmits data with "end of message"
<——————————————	<CR><LF>	

Error processing

The strings received are verified in the TPG500. If an error is detected, a negative acknowledgment <NAK> is output.

Error recognition protocol

HOST TPG500	Explanation
Mnemonics [and parameters] ————————> <CR>[<LF>] ————————————————>	Receives message with "end of message"
***** Transmission or programming error *****	
<——— <NAK><CR><LF>	Negative acknowledgment of a received message
Mnemonics [and parameters] ————————> <CR>[<LF>] ————————————————>	Receives message with "end of message"
<———————————— <ACK><CR><LF>	Positive acknowledgment of a received message

6.3 Mnemonics

		→
ADC	A/D converter test	77
AOM	Analog Output Mode	67
AYT	Are you there?	81
BAI	Transmission rate USB	73
BAL	Backlight	67
BAR	Transmission rate RS485	74
BAU	Transmission rate IFxxx	74
CAx	Leakage current compensation for channels A1 / A2	60
CBx	Leakage current compensation for channels B1 / B2	60
CDA	Calibration date	77
CID	Channel identifier	61
COM	Continuous mode of measurement values	55
COR	Correction factor other gas types	61
DAT	Date	76
DCB	Display control bar graph	68
DCC	Display control contrast	69
DCS	Display control screensave	69
DIS	Display test	78
EEP	EEPROM test	78
EPR	FLASH test	78
ERA	Error relay allocation	70
ERR	Error status	55
ETH	Ethernet configuration	74
EVA	Measurement range end value	70
FIL	Measurement value filter	62
GAS	Gas type correction	62
HDW	Hardware version	78
IOT	I/O test	79
LCM	Start / stop data logger	76
LNG	Language (display)	70
LOC	Keylock	79
MAC	Ethernet MAC address	80
NAD	Node (device) address for RS485	75
PAn	Measurement data and status for channels A1 / A2	56
PBn	Measurement data and status for channels B1 / B2	56
PNR	Firmware version	80
PRX	Measurement data and status for all gauges	57
PUC	Penning underrange control	71
RES	Reset	57
RHR	Operating hours	80
SAV	Save parameters (EEPROM)	71
SAx	Sensor control slot A	63
SBx	Sensor control slot B	64
SCM	Save / load parameters (USB)	77
SEN	Measurement circuit on/off	58
SME	Show me	82
SPA	Sensor control slot A	65
SPB	Sensor control slot B	66
SPS	Switching function status	59
SPx	Switching function 1 … 4	59
TID	Plug-in boards identification	58

6.4 Measurement Mode

6.4.1 COM - Continuous Output of Measurement Values

Transmit: COM [,a] <CR>[<LF>]

	Description
a	Mode, a = 0 –> 100 ms 1 –> 1 s (default) 2 –> 1 minute

Receive: <ACK><CR><LF>

This is immediately followed by continuous output of the measured values at the desired time interval.

Receive: b,x.xEsxx,b,x.xEsxx,b,x.xEsxx,b,x.xEsxx <CR><LF>

	Description
b	Status of the four measurement channels (A1, A2, B1, B2), b = 0 –> Measurement data okay 1 –> Underrange 2 –> Overrange 3 –> Sensor error 4 –> Sensor off 5 –> No hardware
x.xEsxx	Measurement value measurement channel [1] [in current pressure unit] (s = sign)

[1] Values always in exponential format.

6.4.2 ERR - Error Status

Transmit: ERR <CR>[<LF>] Error status

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aaaa <CR><LF>

	Description
aaaa	Error status, aaaa = 0000 –> No error 1000 –> Controller error (see display on front panel) 0100 –> Hardware not installed 0010 –> Inadmissible parameter 0001 –> Syntax error

The error status is cleared when readout, but is reset immediately if the error remains or continues.

6.4.3 PA1 / PA2 - Measurement Data Channels A1 / A2

Transmit: **PAn** <CR>[<LF>]

	Description
n	Measurement value, n = 1 –> Measurement channel A1 2 –> Measurement channel A2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,x.xEsxx <CR><LF>

	Description
a	Status, a = 0 –> Measurement data okay 1 –> Underrange 2 –> Overrange 3 –> Measuring point error (sensor error) 4 –> Measuring point switched off 5 –> No hardware
x.xEsxx	Measurement value [in current pressure unit] (s = sign)

6.4.4 PB1 / PB2 - Measurement Data Channels B1 / B2

Transmit: **PBn** <CR>[<LF>]

	Description
n	Measurement value, n = 1 –> Measurement channel B1 2 –> Measurement channel B2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,x.xEsxx <CR><LF>

	Description
a	Status, a = 0 –> Measurement data okay 1 –> Underrange 2 –> Overrange 3 –> Measuring point error (sensor error) 4 –> Measuring point switched off 5 –> No hardware
x.xEsxx	Measurement value [in current pressure unit] (s = sign)

6.4.5 PRX - Measurement Data ChannelsA1, A2, B1, B2

Transmit: **PRX** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,x.xEsxx,a,x.xEsxx,a,x.xEsxx,a,x.xEsxx <CR><LF>

	Description
a	Status measurement channel, a = 0 –> Measurement data okay 1 –> Underrange 2 –> Overrange 3 –> Measuring point error (sensor error) 4 –> Measuring point switched off 5 –> No hardware
x.xEsxx	Measurement value gauge [in current pressure unit] (s = sign)

6.4.6 RES - Reset

Transmit: **RES** [,a] <CR>[<LF>]

	Description
a	a = 1 –> Re-start and read out the pending error messages.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: b[,b][,b][…] <CR><LF>

	Description
b	List of all current error messages, b = 0 –> No error 1 –> Watchdog has triggered 3 –> FLASH error 5 –> EEPROM error

6.4.7 SEN – Switching Measurement Circuit On/Off

Transmit: **SEN** [,a,b,c,d] <CR>[<LF>]

	Description
a	Measurement circuit A1, a =
	0 –> No change
	1 –> Turn measurement circuit off
	2 –> Automatic
	3 –> Turn measurement circuit on
b	Measurement circuit A2
c	Measurement circuit B1
d	Measurement circuit B2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,d <CR><LF>

	Description
a	Status measurement circuit A1, a =
	0 –> No measurement circuit
	1 –> Gauge turned off
	2 –> Automatic
	3 –> Gauge turned on
b	Status measurement circuit A2
c	Status measurement circuit B1
d	Status measurement circuit B2

6.4.8 TID - Measurement Circuit Identification

Plug-in board identification.

Transmit: **TID** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c <CR><LF>

	Description
a, b	CP300x9
	CP300T11
	CP300T11L
	NO BOARD
c	IF300x [1]
	IF500PN
	NO BOARD

[1] The IF300x plug-in boards (IF300A, IF300P and IF301P) have the same identification and cannot be distinguished.

6.5 Switching Function Parameters

6.5.1 SPS - Switching Function Status

Transmit: **SPS** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,d,e,f <CR><LF>

	Description
a	Status switching function 1, a = 0 –> Off 1 –> On
b	Status switching function 2
c	Status switching function 3
d	Status switching function 4
e	Switching function A
f	Switching function B

6.5.2 SP1 … SP4 - Switching Function 1 … 4

Transmit: **SPx** [x.xEsxx,y.yEsyy,a,b] <CR>[<LF>]

	Description
x	Switching function, x = 1 –> Switching function 1 2 –> Switching function 2 3 –> Switching function 3 4 –> Switching function 4
x.xEsxx	Lower threshold [in current pressure unit] (s = sign)
y.yEsyy	Upper threshold [in current pressure unit] (s = sign)
a	Switching function assignment, a = 0 –> Turned off 1 –> Measurement channel A1 2 –> Measurement channel A2 3 –> Measurement channel B1 4 –> Measurement channel B2 5 –> Turned on
b	ON-Timer (0 … 100 seconds)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x.xEsxx,y.yEsyy,a,b <CR><LF>

	Description
x.xEsxx	Lower threshold [in current pressure unit] (s = sign)
y.yEsyy	Upper threshold [in current pressure unit] (s = sign)
a	Switching function assignment
b	ON-Timer (0 … 100 seconds)

6.6 Gauge Parameters

6.6.1 CA1, CA2 - Leakage Current Compensation

Leakage current compensation for measurement channels A1 and A2.

Transmit: **CAx** [,a,b] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b <CR><LF>

	Description
a	Leakage current compensation 0 –> Off (default) 1 –> On 2 –> Determine value automatically and activate leakage current compensation.
b	Compensation value (used for writing only if a = 1)

6.6.2 CB1, CB2 - Leakage Current Compensation

Leakage current compensation for measurement channels B1 and B2.

Transmit: **CBx** [,a,b] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b <CR><LF>

	Description
a	Leakage current compensation 0 –> Off (default) 1 –> On 2 –> Determine value automatically and activate leakage current compensation.
b	Compensation value (used for writing only if a = 1)

6.6.3 CID - Measuring Point Name

Name of the measuring point (max. 8 characters). Only capital letters, numbers and underlines permitted.

Transmit: **CID** [,aaaaaaaa,bbbbbbbb,cccccccc,dddddddd] <CR>[<LF>]

	Description
aaaaaaaa	Name of measurement channel A1
bbbbbbbb	Name of measurement channel A2
cccccccc	Name of measurement channel B1
dddddddd	Name of measurement channel B2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aaaaaaaa,bbbbbbbb,cccccccc,dddddddd <CR><LF>

	Description
aaaaaaaa	Name of measurement channel A1
bbbbbbbb	Name of measurement channel A2
cccccccc	Name of measurement channel B1
dddddddd	Name of measurement channel B2

6.6.4 COR - Correction factor

Gas type correction factor for measurement channels A1, A2, B1 and B2.

Transmit: **COR** [,a.aa,b.bb,c.cc,d.dd] <CR>[<LF>]

	Description
a.aa	Correction factor for measurement channel A1, adjustable in the range 0.20 … 8.00
b.bb	Correction factor for measurement channel A2
c.cc	Correction factor for measurement channel B1
d.dd	Correction factor for measurement channel B2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a.aa,b.bb,c.cc,d.dd <CR><LF>

	Description
a.aa	Correction factor for measurement channel A1
b.bb	Correction factor for measurement channel A2
c.cc	Correction factor for measurement channel B1
d.dd	Correction factor for measurement channel B2

6.6.5 FIL - Measurement Value Filter

Transmit: **FIL** [,a,b,c,d] <CR>[<LF>]

	Description
a	Filter measurement channel A1, a =
	0 –> Filter OFF
	1 –> f = 100 Hz [1]
	2 –> f = 10 Hz [1] (default)
	3 –> f = 1 Hz [1]
	4 –> f = 0.1 Hz [1]
b	Filter measurement channel A2
c	Filter measurement channel B1
d	Filter measurement channel B2

[1] The specified frequency is the cut-off frequency of the filter.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,d <CR><LF>

	Description
a	Filter measurement channel A1
b	Filter measurement channel A2
c	Filter measurement channel B1
d	Filter measurement channel B2

6.6.6 GAS - Gas Type Correction

Gas type correction for measurement channels A1, A2, B1 and B2.

Transmit: **GAS** [,a,b,c,d] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,d <CR><LF>

	Description
a	Gas type correction for measurement channel A1
	0 –> Nitrogen / air
	1 –> Helium
	2 –> Neon
	3 –> Argon
	4 –> Krypton
	5 –> Xenon
	6 –> Hydrogen
	7 –> other gas
b	Gas type correction for measurement channel A2
c	Gas type correction for measurement channel B1
d	Gas type correction for measurement channel B2

6.7 Gauge Control Group

6.7.1 SA1, SA2 - Gauge Control Slot A

Gauge control for measuring channels A1 and A2.

Transmit: **SAx** [,a,b,c.ccEscc,d.ddEsdd] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c.ccEscc,d.ddEsdd <CR><LF>

	Description
a	Gauge activation, a =
	0 –> Manual (default)
	1 –> Hot start
	2 –> Via measurement channel A1
	3 –> Via measurement channel A2
	4 –> Via measurement channel B1
	5 –> Via measurement channel B2
	6 –> Hotstart + A1
	7 –> Hotstart + A2
	8 –> Hotstart + B1
	9 –> Hotstart + B2
	10 –> Previous
	11 –> Previous + A1
	12 –> Previous + A2
	13 –> Previous + B1
	14 –> Previous + B2
b	Gauge deactivation, b =
	0 –> Manual (default)
	1 –> Self control
	2 –> Via measurement channel A1
	3 –> Via measurement channel A2
	4 –> Via measurement channel B1
	5 –> Via measurement channel B2
c.ccEscc	ON threshold in current pressure unit (s = sign)
d.ddEsdd	OFF threshold in current pressure unit (s = sign)

6.7.2 SB1, SB2 - Gauge Control Slot B

Gauge control for measuring channels B1 and B2.

Transmit: **SBx** [,a,b,c.ccEscc,d.ddEsdd] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c.ccEscc,d.ddEsdd <CR><LF>

	Description
a	Gauge activation, a =
	0 –> Manual (default)
	1 –> Hot start
	2 –> Via measurement channel A1
	3 –> Via measurement channel A2
	4 –> Via measurement channel B1
	5 –> Via measurement channel B2
	6 –> Hotstart + A1
	7 –> Hotstart + A2
	8 –> Hotstart + B1
	9 –> Hotstart + B2
	10 –> Previous
	11 –> Previous + A1
	12 –> Previous + A2
	13 –> Previous + B1
	14 –> Previous + B2
b	Gauge deactivation, b =
	0 –> Manual (default)
	1 –> Self control
	2 –> Via measurement channel A1
	3 –> Via measurement channel A2
	4 –> Via measurement channel B1
	5 –> Via measurement channel B2
c.ccEscc	ON threshold in current pressure unit (s = sign)
d.ddEsdd	OFF threshold in current pressure unit (s = sign)

6.7.3 SPA - Gauge Control Slot A

Gauge control for measuring channels A1 and A2. Both channels are controlled simultaneously.

To use all TPG500 control options, we recommend using the commands **SA1** and **SA2** (→ 🗎 63).

Transmit: **SPA** [,a.aEsaa,b.bEsbb,c] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a.aEsaa,b.bEsbb,c <CR><LF>

	Description
a.aEsaa	ON threshold in current pressure unit 1.0E-11 … 9.9E+3 mbar (s = sign)
b.bEsbb	OFF threshold in current pressure unit 1.0E-11 … 9.9E+3 mbar (s = sign)
c	Measurement channel assignment, c = 0 –> No assignment 1 –> Measurement channel A1 2 –> Measurement channel A2 3 –> Measurement channel B1 4 –> Measurement channel B2 5 –> Measurement channel A1 [1)] 6 –> Measurement channel A2 [1)] 7 –> Measurement channel B1 [1)] 8 –> Measurement channel B2 [1)] 9 –> complex [2)] (read only)

1) Self control with switch-on delay. The gauge is switched on via the selected measuring channel, but switches itself off. The self-monitoring is only enabled after a delay time of approx. 10 s.

2) If the control set with the SA1 and SA2 commands cannot be mapped in the SPA command, this is indicated with parameter value c=9 reading.

6.7.4 SPB - Gauge Control Slot B

Gauge control for measuring channels B1 and B2. Both channels are controlled simultaneously.

To use all TPG500 control options, we recommend using the commands **SB1** and **SB2** (→ 🗎 64).

Transmit: **SPB** [,a.aEsaa,b.bEsbb,c] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a.aEsaa,b.bEsbb,c <CR><LF>

	Description
a.aEsaa	ON threshold in current pressure unit 1.0E-11 … 9.9E+3 mbar (s = sign)
b.bEsbb	OFF threshold in current pressure unit 1.0E-11 … 9.9E+3 mbar (s = sign)
c	Measurement channel assignment, c =
	0 –> No assignment
	1 –> Measurement channel A1
	2 –> Measurement channel A2
	3 –> Measurement channel B1
	4 –> Measurement channel B2
	5 –> Measurement channel A1 [1)]
	6 –> Measurement channel A2 [1)]
	7 –> Measurement channel B1 [1)]
	8 –> Measurement channel B2 [1)]
	9 –> complex [2)] (read only)

[1)] Self control with switch-on delay. The gauge is switched on via the selected measuring channel, but switches itself off. The self-monitoring is only enabled after a delay time of approx. 10 s.

[2)] If the control set with the SB1 and SB2 commands cannot be mapped in the SPB command, this is signalled when reading with the parameter value c=9.

6.8 General Parameters

6.8.1 AOM - Analog Output Mode

Transmit: **AOM** [,a] <CR>[<LF>]

	Description
a	Analog Output mode, a = 0 –> Off (default) 1 –> 0 … 5 V 2 –> 0 … 10 V 3 –> 4 … 20 mA

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

	Description
a	Analog Output mode

6.8.2 BAL - Backlight

Transmit: **BAL** [,a] <CR>[<LF>]

	Description
a	Backlight in percent, a = 0 … 100 (default = 40%) 100% is full brightness

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Backlight

6.8.3 DCB - Display Control Bar Graph

Transmit: DCB [,a,b] <CR>[<LF>]

	Description
a	Measurement channel, a =
	0 –> Measurement channel A1
	1 –> Measurement channel A2
	2 –> Measurement channel B1
	3 –> Measurement channel B2
b	Bar graph display, b =
	0 –> Off (default)
	1 –> Bar graph covering full scale range
	2 –> Bar graph covering full scale range and setpoint threshold
	3 –> Bar graph covering a decade according to current measurement value
	4 –> Bar graph covering a decade according to current measurement value and setpoint threshold
	5 –> p = $f_{(t)}$, auto-scaled, 0.2 seconds / pixel For each measurement channel, a measurement value is stored in a table every 200 ms and the last 100 measurement values (=100 pixels) are displayed autoscaled. The data string displayed corresponds to a logging duration of 20 seconds.
	6 –> p = $f_{(t)}$, auto-scaled, 1 second / pixel For each measurement channel, a measurement value is stored in a table every second and the last 100 measurement values (=100 pixels) are displayed autoscaled. The data string displayed corresponds to a logging duration of 100 seconds.
	7 –> p = $f_{(t)}$, auto-scaled, 6 seconds / pixel For each measurement channel, a measurement value is stored in a table every 6 seconds and the last 100 measurement values (=100 pixels) are displayed autoscaled. The data string displayed corresponds to a logging duration of 10 minutes.
	8 –> p = $f_{(t)}$, auto-scaled, 1 minute / pixel For each measurement channel, a measurement value is stored in a table every minute and the last 100 measurement values (=100 pixels) are displayed autoscaled. The data string displayed corresponds to a logging duration of 100 minutes.
	9 –> p = $f_{(t)}$, auto scaled, 30 minutes / Pixel For each measurement channel, a measurement value is stored in a table every 30 minutes and the last 100 measurement values (=100 pixels) are displayed autoscaled. The data string displayed corresponds to a logging duration of 50 hours.
	10 –> For the selected measuring channel, the type of the plug-in board and the name of the measuring point is displayed.
	11 –> For the selected measuring channel, the name of the measuring point and the assigned switching points are displayed.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b <CR><LF>

	Description
a	Measurement channel
b	Bar graph display

6.8.4 DCC - Display Control Contrast

Transmit: **DCC** [,a] <CR>[<LF>]

	Description
a	Contrast in percent, a = 0 … 100 (default = 40%) 100% = full contrast

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Contrast

6.8.5 DCS - Display Control Screensave

Transmit: **DCS** [,a] <CR>[<LF>]

	Description
a	Screensave, a = 0 –> Off (default) 1 –> After 10 minutes 2 –> After 30 minutes 3 –> After 1 hour 4 –> After 2 hours 5 –> After 8 hours 6 –> Switches the backlight off completely after 1 minute

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Screensave

6.8.6 ERA - Error Relay Allocation

Transmit: **ERA** [,a] <CR>[<LF>]

	Description
a	Switching behaviour error relay, a = 0 –> Switches for all errors (default) 1 –> Only unit errors 2 –> Sensor error A1 and unit error 3 –> Sensor error A2 and unit error 4 –> Sensor error B1 and unit error 5 –> Sensor error B2 and unit error

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Switching behaviour error relay

6.8.7 EVA - Measurement Range End Value

Transmit: **EVA** [,a] <CR>[<LF>]

	Description
a	Measurement range end value, a = 0 –> UR or OR is displayed when an underrange or over-range occurs (default) 1 –> The measurement range end value is displayed when an underrange or overrange occurs

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Measurement range end value

6.8.8 LNG - Language (Display)

Transmit: **LNG** [,a] <CR>[<LF>]

	Description
a	Language, a = 0 –> English (default) 1 –> German 2 –> French

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Language

6.8.9 PUC - Penning Underrange Control

Transmit: **PUC** [,a] <CR>[<LF>]

	Description
a	Underrange control, a = 0 –> Off (default) 1 –> On

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Underrange control

6.8.10 SAV - Save Parameters (EEPROM)

Caution

Interruption of the current connection

Resetting the parameters to factory settings also resets communication parameters (e.g. transmission rate, Ethernet settings) and can lead to an interruption of the current connection.

Reset parameter to factory setting only if it is guaranteed that no malfunction is triggered by an interruption of the current connection.

Transmit: **SAV** [,a] <CR>[<LF>]

	Description
a	Save parameters to EEPROM, a = 0 –> Save default parameters (default) 1 –> Save user parameters (user) 2 –> Save user parameters with hotstart (user hotstart)

Receive: <ACK><CR><LF>

Command "SAV,0"

Resets all parameters to factory settings.

Command "SAV,1"

Stores parameter values that have been changed via the serial interface. Parameters that have been changed via the buttons on the controller are automatically saved.

Command "SAV,2"

Saves as "SAV,1" and additionally activates the hotstart. Thus, a measuring circuit will be switched on automatically after a power failure. The measuring circuit must be switched on at the time of saving.

6.8.11 UNI - Pressure Unit

Transmit: **UNI** [,a] <CR>[<LF>]

	Description
a	Pressure unit, a = 0 –> mbar (default) 1 –> Torr 2 –> Pascal 3 –> Micron 4 –> hPascal 5 –> Volt 6 –> Ampere

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Pressure unit

6.9 Communication Parameters

6.9.1 BAI - Transmission Rate USB

When switching over, the response is already transmitted with the changed transmission rate.

Transmit: **BAI** [,a] <CR>[<LF>]

	Description
a	Transmission rate, a = 0 –> 9600 Baud 1 –> 19200 Baud 2 –> 38400 Baud 3 –> 57600 Baud 4 –> 115200 Baud (default)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

	Description
a	Transmission rate

6.9.2 BAR - Transmission Rate RS485

When switching over, the response is already transmitted with the changed transmission rate.

Transmit: **BAR** [,a] <CR>[<LF>]

	Description
a	Transmission rate, a = 0 –> 9600 Baud 1 –> 19200 Baud 2 –> 38400 Baud 3 –> 57600 Baud 4 –> 115200 Baud (default)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Transmission rate

6.9.3 BAU - Transmission Rate IFxxx

If the TPG500 is operated with the Profibus interface board IF300P, the transmission rate must be set to 19200 Baud.

If the TPG500 is operated with the Profinet interface board IF500PN, the transmission rate is set to 115200 Baud automatically. This transmission rate cannot be changed.

Transmit: **BAU** [,a] <CR>[<LF>]

	Description
a	Transmission rate IFxxx, a = 0 –> AUTO 1 –> 1200 Baud 2 –> 2400 Baud 3 –> 19200 Baud 4 –> 4800 Baud 9 –> 9600 Baud (default)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Transmission rate

6.9.4 ETH - Ethernet Configuration

With dynamic DHCP configuration, the parameters b, c and d are automatically determined and do not have to be specified.

Transmit: **ETH** [,a,bbb.bbb.bbb.bbb,ccc.ccc.ccc.ccc,ddd.ddd.ddd.ddd] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,bbb.bbb.bbb.bbb,ccc.ccc.ccc.ccc,ddd.ddd.ddd.ddd <CR><LF>

	Description
a	DHCP (dynamic host configuration protocol), a = 0 –> Static (default) 1 –> Dynamic
bbb.bbb.bbb.bbb	IP address
ccc.ccc.ccc.ccc	Subnet address
ddd.ddd.ddd.ddd	Gateway address

Receive: <ACK><CR><LF>
Receive: <ENQ>

Receive: a,bbb.bbb.bbb.bbb,ccc.ccc.ccc.ccc,ddd.ddd.ddd.ddd <CR><LF>

	Description
a	DHCP
bbb.bbb.bbb.bbb	IP address
ccc.ccc.ccc.ccc	Subnet address
ddd.ddd.ddd.ddd	Gateway address

6.9.5 NAD - Node Address (unit address) for RS485

Transmit: **NAD** [,a] <CR>[<LF>]

	Description
a	Unit address, a = 1 … 24 (1 = default)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Unit address

The node address is used to address the devices if several devices are connected via a bus. Only the device that was addressed once with <ESC> a responds. If another device is to respond, it must be addressed. The remaining devices release the bus.

Transmit: <ESC>a

6.10 Data Logger Parameters

The group is only available when a USB memory stick formatted for the FAT file system (FAT32) is plugged in. Use memory sticks with max. 32 GB.

6.10.1 DAT - Date

Transmit: **DAT** [,yyyy-mm-dd] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: yyyy-mm-dd <CR><LF>

	Description
yyyy-mm-dd	Current date in the format yyyy-mm-dd

6.10.2 LCM - Start / Stop Data Logger

Further processing of recorded data (e.g. with Excel), pay attention to the corresponding country-specific decimal separator (comma or dot).

Transmit: **LCM** [,a,b,c,ddddddddd,e] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,ddddddddd,e <CR><LF>

	Description
a	Data logger command, a = 0 –> Stop / recording stopped 1 –> Start / recording running 2 –> Clear / deletion of measurement data file from USB memory stick
b	Data logging interval, b = 0 –> Recording interval 1 s 1 –> Recording interval 10 s 2 –> Recording interval 30 s 3 –> Recording interval 60 s 4 –> With measurement value change ≥1% 5 –> With measurement value change ≥5%
c	Decimal separator, c = 0 –> , (decimal comma) (default) 1 –> . (decimal point)
ddddddddd	File name (max. 8 characters)
e	Recording mode, e = 0 –> Manual (default) 1 –> Automatic

6.10.3 TIM - Time

Transmit: **TIM** [,hh:mm] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: hh:mm <CR><LF>

	Description
hh:mm	Current time in the format hh:mm [24 hours]

6.11 Group Setup

The group is only available when a USB memory stick formatted for the FAT file system (FAT32) is plugged in. Use memory sticks with max. 32 GB.

6.11.1 SCM - Store / Load Parameters (USB)

Transmit: **SCM** [,a,b] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Setup parameters, a = 0 –> Storage completed (read only) 1 –> Loading all parameters from the TPG500 the to the USB memory stick 2 –> Loading all parameters from the USB memory stick to the TPG500 3 –> Formatting USB memory stick (FAT32) 4 –> Deleting parameter files (extension .CSV) from the USB memory stick
b	Number in file name (0 … 99)

6.12 Test Parameters

(For service personnel)

6.12.1 ADC - A/D Converter Test

Transmit: **ADC** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aa.aa,bb.bb,cc.cc,dd.dd <CR><LF>

	Description
aa.aa	A/D converter channel A1 Measurement signal [0.00 … 11.00 V]
bb.bb	A/D converter channel A2 Measurement signal [0.00 … 11.00 V]
cc.cc	A/D converter channel B1 Measurement signal [0.00 … 11.00 V]
dd.dd	A/D converter channel B2 Measurement signal [0.00 … 11.00 V]

6.12.2 CDA - Re-calibration

Transmit: **CDA** [,yyyy-mm-dd] <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: yyyy-mm-dd <CR><LF>

	Description
yyyy-mm-dd	Date of next re-calibration. If the date was reached, a warning is displayed.

6.12.3 DIS - Display Test

Transmit: **DIS** [,a] <CR>[<LF>]

	Description
a	Display test, a = 0 –> Stops test - display matches operating mode (default) 1 –> Starts test - all LEDs on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

	Description
a	Display test status

6.12.4 EEP - EEPROM Test

Test of the parameter memory.

Transmit: **EEP** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration <1 s)

Do not repeat the test continuously (EEPROM life).

Receive: aaaa <CR><LF>

	Description
aaaa	Error word

6.12.5 EPR - FLASH Test

Test of the program memory.

Transmit: **EPR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (very brief)

Receive: aaaa <CR><LF>

	Description
aaaa	Error word

6.12.6 HDW - Hardware Version

Transmit: **HDW** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a.aa <CR><LF>

	Description
a.aa	Hardware version, e.g. 1.00

6.12.7 IOT - I/O Test

Caution

The relays switch irrespective of the pressure.

Starting a test program may cause unwanted effects in connected control systems.

Disconnect all sensor cables and control system lines to ensure that no control commands or messages are triggered by mistake.

Transmit: **IOT** [,a,bb] <CR>[<LF>]

	Description
a	Test status, a =
	0 –> Test stopped
	1 –> Test running
bb	Relay status (in hex format), bb =
	00 –> All relays deactivated
	01 –> Switching function relay 1 activated
	02 –> Switching function relay 2 activated
	04 –> Switching function relay 3 activated
	08 –> Switching function relay 4 activated
	10 –> Error relay activated
	1F –> All relays activated

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,bb <CR><LF>

	Description
a	I/O test status
bb	Relay status

Example: 14 = Switching function relay 3 and error relay activated

6.12.8 LOC - Keylock

Transmit: **LOC** [,a] <CR>[<LF>]

	Description
a	Keylock, a =
	0 –> Off (default)
	1 –> On
	2 –> On [1] (only via interface)

[1] If the input lock was activated via the interface with a=2, it can only be deactivated again via the interface.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Keylock status

6.12.9 MAC - Ethernet MAC Address

Transmit: **MAC** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aa-aa-aa-aa-aa-aa <CR><LF>

	Description
aa-aa-aa-aa-aa-aa	Ethernet MAC address of the TPG500: 00-A0-41-xx-xx-xx

6.12.10 PNR - Firmware Version

Transmit: **PNR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a.aa <CR><LF>

	Description
a.aa	Firmware version, e.g. 1.30

6.12.11 RHR - Operating Hours

Transmit: **RHR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Run (operating) hours, e.g. 24 [hours]

6.12.12 TKB - Operator Keys Test

Transmit: **TKB** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: abcd <CR><LF>

	Description
a	Key 1, a = 0 –> Not pushed 1 –> Pushed
b	Key 2, b = 0 –> Not pushed 1 –> Pushed
c	Key 3, c = 0 –> Not pushed 1 –> Pushed
d	Key 4, d = 0 –> Not pushed 1 –> Pushed

6.12.13 TLC - Torr Lock

Transmit: **TLC** [,a] <CR>[<LF>]

	Description
a	Torr lock, a = 0 –> Off (default) 1 –> On

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Torr lock status

6.12.14 WDT - Watchdog Control

Transmit: **WDT** [,a] <CR>[<LF>]

	Description
a	Watchdog control, a = 0 –> Manual error acknowledgement 1 –> Automatic error acknowledgement [1] (default)

[1] If the watchdog has responded, the error is automatically acknowledged and cleared after 2 s.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	Watchdog control

6.13 Further Parameters

6.13.1 AYT - Are you There?

Transmit: **AYT** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a,b,c,d,e <CR><LF>

	Description
a	Type of the unit, e.g. TPG500
b	Model No. of the unit, e.g. 398-400
c	Serial No. of the unit, e.g. 100
d	Firmware version of the unit, e.g. 1.30
e	Hardware version of the unit, e.g. 1.00

6.13.2 SME - Show Me

Transmit: **SME** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: a <CR><LF>

	Description
a	0 –> Visualization off 1 –> Visualization on: The backlight of the addressed controller flashes for 5 seconds.

6.13.3 TMP - Inner Temperature of the Unit

Inner temperature of the TPG500.

Transmit: **TMP** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aa <CR><LF>

	Description
aa	Temperature (±2 °C) [°C]

6.13.4 VBT - Battery Voltage

Transmit: **VBT** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: aaaa <CR><LF>

	Description
aaaa	Battery voltage [mV] Nominal value: 3 V

6.14 Example

"Transmit (T)" and "Receive (R)" are related to Host.

T: **TID** <CR> [<LF>]	Request for gauge identification
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: CP300Cx9,IF30x <CR> <LF>	Gauge identifications
T: **SEN** <CR> [<LF>]	Request for gauge statuses
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 0,0,0,0 <CR> <LF>	Gauge statuses
T: **SP1** <CR> [<LF>]	Request for parameters of switching function 1 (setpoint 1)
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 1.0E-09,9.0E-07,2 <CR> <LF>	Thresholds
T: **SP1**,6.8E-3,9.8E-3,2 <CR> [<LF>]	Modification of parameters of switching function 1 (setpoint 1)
R: <ACK> <CR> <LF>	Positive acknowledgement
T: **FOL**, 1,2,2,2 <CR> [<LF>]	Modification of filter time constant (syntax error)
R: <NAK> <CR> <LF>	Negative acknowledgement
T: <ENQ>	Request for data transmission
R: 0001 <CR> <LF>	ERROR word
T: **FIL**, 1,2,2,2 <CR> [<LF>]	Modification of filter time constant
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 1,2,2,2 <CR> <LF>	Filter time constants

7 Maintenance

Cleaning the TPG500

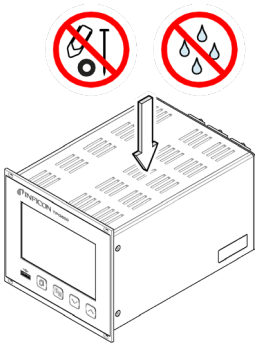
For cleaning the outside of the unit a slightly moist cloth will usually do. Do not use any aggressive or scouring cleaning agents.

DANGER

Mains voltage

Contact with live parts is extremely hazardous when liquids penetrate into the unit.

Make sure no liquids penetrate into the equipment.



Battery replacement

The product contains a battery (type CR2032, service life >10 years) in order to maintain the data integrity of the real-time clock. Battery replacement is necessary if the real-time clock repeatedly shows an incorrect date. Please contact your local INFICON service center.

8 Troubleshooting

Signalization of errors

The error is shown in the dot matrix and the error relay opens (connection *CONTOL* → 🗎 16).

Error messages

	Possible cause and remedy/acknowledgement
SENSOR ERROR CH1	Interruption or instability in sensor line or connector (Sensor error). ⇨ Acknowledge with the key.

	Possible cause and remedy/acknowledgement
WATCHDOG ERROR	The TPG500 has been turned on too fast after power off. ⇨ Acknowledge with the key. If the watchdog is set to Auto, the TPG500 acknowledges the message automatically after 2 s (→ 🗎 48).
	The watchdog has tripped because of a severe electric disturbance or an operating system error. ⇨ Acknowledge with the key. If the watchdog is set to AUTO, the TPG500 acknowledges the message automatically after 2 s (→ 🗎 48).

	Possible cause and remedy/acknowledgement
UART ERROR	Error in UART. ⇨ Acknowledge with the key.

	Possible cause and remedy/acknowledgement
PROGRAM CORRUPT	Program memory error (FLASH). ⇨ Acknowledge with the key.

	Possible cause and remedy/acknowledgement
DATA CORRUPTED	Parameter memory error (EEPROM). ⇨ Acknowledge with the key.

	Possible cause and remedy/acknowledgement
DISPLAY ERROR	Display driver error. ⇨ Acknowledge with the key.

	Possible cause and remedy/acknowledgement
FATAL ERROR	General, serious error ⇨ Acknowledge with the key.

Technical support

If the problem persists after the message has been acknowledged several times and/or the gauge has been exchanged, please contact your nearest INFICON service center.

9 Repair

Return defective products to your nearest INFICON service center for repair.

INFICON assumes no liability and the warranty is rendered null and void if repair work is carried out by the end-user or by third parties.

10 Accessories

Type	Description	Ordering No.
CP300C9	Pirani / cold cathode measurement board (Index B and higher)	IO441000
CP300T11	Pirani / cold cathode measurement board (Index B and higher)	IO441080
CP300T11L	Pirani / cold cathode measurement board (Index A and higher)	IO441120
IF300A	Interface and relay board (RS232C)	IO441130
IF300P	Interface and relay board with mechanical relays (Profibus)	IO441395
IF301P	Interface and relay board with PhotoMOS relays (Profibus)	IO441396
IF500PN	Interface board (Profinet)	IO441595
	Mating connector, D-sub 9-pin, male, for IF300A	BG 441 128-T
	Mating connector, D-sub 15-pin, female, for IF300A / C, relay output	BG 441 129-T
	Blanking panel for measurement boards	IO441259
	Blanking panel for interface and relay boards	IO441017

11 Storage

Caution

Electronic components.

Inappropriate storage (static electricity, humidity etc.) may damage electronic components.

Store the product in an antistatic bag or container. Observe the relevant specifications under Technical Data (→ 🗎 9).

12 Disposal

WARNING

Substances detrimental to the environment.

Products or parts thereof (mechanical and electric components, operating fluids etc.) may be detrimental to the environment.

Please dispose of such materials in accordance with the relevant local regulations.

After disassembling the product, separate its components in electronic and non-electronic components and recycled.

Appendix

A: ConversionTables

Weights

	kg	lb	slug	oz
kg	1	2.205	68.522×10^{-3}	35.274
lb	0.454	1	31.081×10^{-3}	16
slug	14.594	32.174	1	514.785
oz	28.349×10^{-3}	62.5×10^{-3}	1.943×10^{-3}	1

Pressures

	N/m^2, Pa	Bar	mBar, hPa	Torr	at
N/m^2, Pa	1	10×10^{-6}	10×10^{-3}	7.5×10^{-3}	9.869×10^{-6}
Bar	100×10^{3}	1	10^{3}	750.062	0.987
mBar, hPa	100	10^{-3}	1	750.062×10^{-3}	0.987×10^{-3}
Torr	133.322	1.333×10^{-3}	1.333	1	1.316×10^{-3}
at	101.325×10^{3}	1.013	1.013×10^{3}	760	1

Pressure units used in the vacuum technology

	mBar	Bar	Pa	hPa	kPa	Torr mm HG
mBar	1	1×10^{-3}	100	1	0.1	0.75
Bar	1×10^{3}	1	1×10^{5}	1×10^{3}	100	750
Pa	0.01	1×10^{-5}	1	0.01	1×10^{-3}	7.5×10^{-3}
hPa	1	1×10^{-3}	100	1	0.1	0.75
kPa	10	0.01	1×10^{3}	10	1	7.5
Torr mm HG	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

1 Pa = 1 N/m^2

Linear measurements

	mm	m	inch	ft
mm	1	10^{-3}	39.37×10^{-3}	3.281×10^{-3}
m	10^{3}	1	39.37	3.281
inch	25.4	25.4×10^{-3}	1	8.333×10^{-2}
ft	304.8	0.305	12	1

Temperature

	Kelvin	Celsius	Fahrenheit
Kelvin	1	°C+273.15	(°F+459.67)×5/9
Celsius	K-273.15	1	5/9×°F-17.778
Fahrenheit	9/5×K-459.67	9/5×(°C+17.778)	1

B: Relationship Measuring Signal vs. Pressure

B 1: Pirani Gauges, 0 … 10 V

Conversion formulae

$$p = c \times 10^{(0.7 \times U)}$$

$$U = 10/7 \times (\log p - \log c)$$

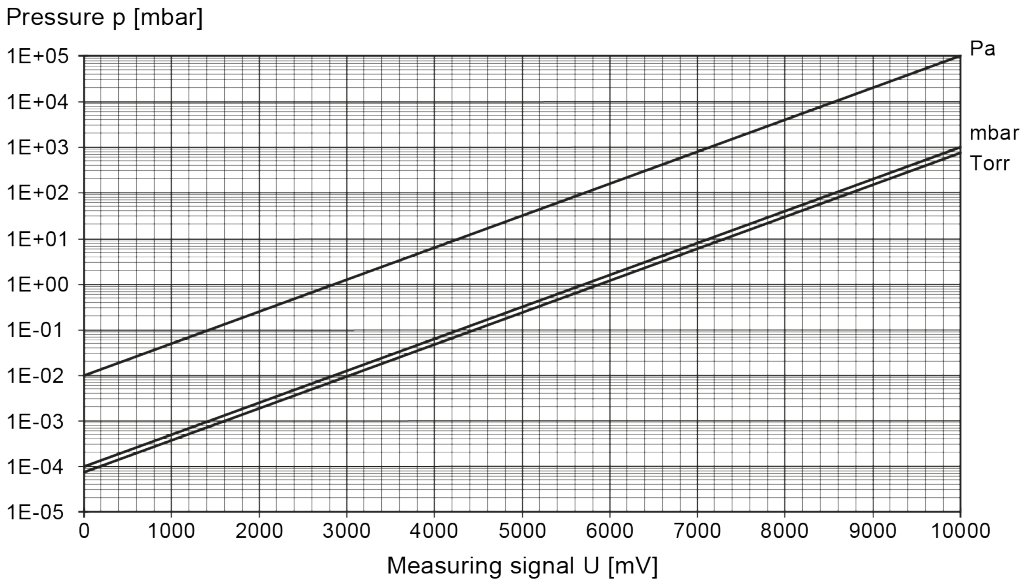
valid in the range:

1×10^{-4} mbar < p < 1000 mbar
7.5×10^{-5} Torr < p < 750 Torr
1×10^{-2} Pa < p < 1×10^{5} Pa

where

Measuring signal (output voltage) U	Pressure p	Constant (pressure unit dependent) c
[V]	[mbar]	1×10^{-4}
[V]	[Pa]	0.01
[V]	[kPa]	1×10^{5}
[V]	[Torr]	7.5×10^{-5}
[V]	[mTorr]	0.075

Conversion curve



B 2: Pirani Gauges, 4 … 20 mA

Conversion formulae

$$p = d \times 10^{(7/16 \times I)}$$

$$I = 16/7 \times (\log p - \log d)$$

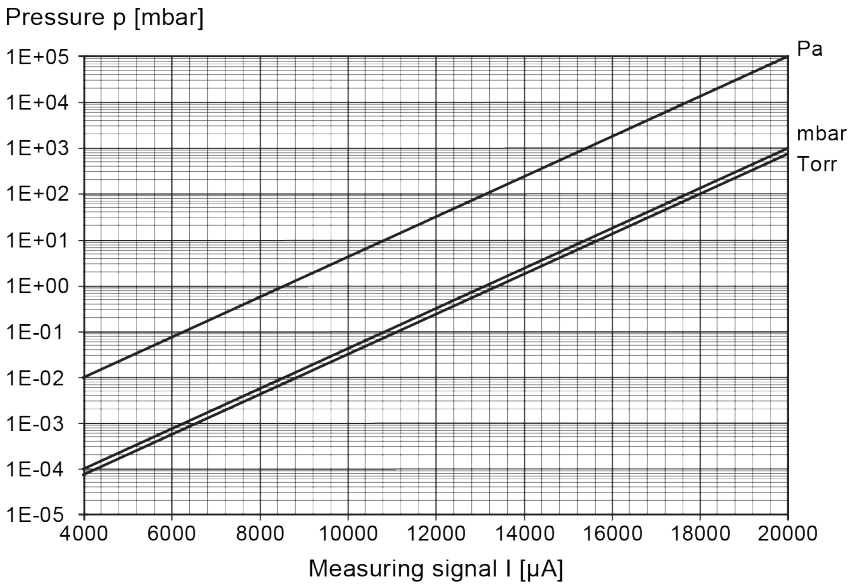
valid in the range:

1×10^{-4} mbar < p < 1000 mbar
7.5×10^{-5} Torr < p < 750 Torr
1×10^{-2} Pa < p < 1×10^{5} Pa

where

Measuring signal (output current) I	Pressure p	Constant (pressure unit dependent) d
[mA]	[mbar]	1.778×10^{-6}
[mA]	[Pa]	1.778×10^{-4}
[mA]	[kPa]	1.778×10^{-7}
[mA]	[Torr]	1.334×10^{-6}
[mA]	[mTorr]	1.334×10^{-3}

Conversion curve



B 3: Measuring Board CP300C9, 0 … 10 V

Conversion formulae

$$p = c \times 10^{(0.7 \times U)}$$

$$U = 10/7 \times (\log p - \log c)$$

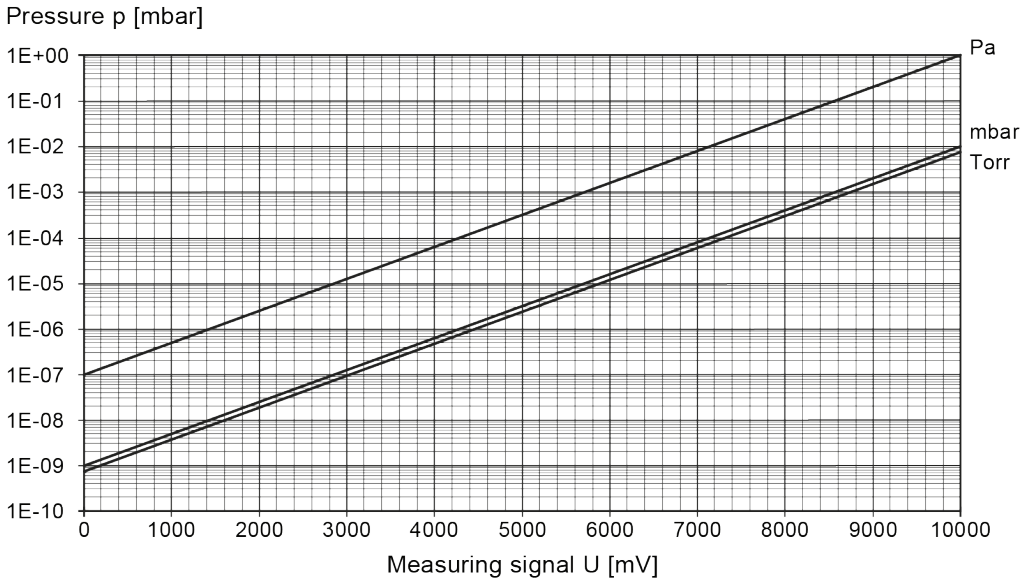
valid in the range:

1×10^{-9} mbar < p < 1×10^{-2} mbar
7.5×10^{-10} Torr < p < 7.5×10^{-3} Torr
1×10^{-7} Pa < p < 1 Pa

where

Measuring signal (output voltage) U	Pressure p	Constant (pressure unit dependent) c
[V]	[mbar]	1×10^{-9}
[V]	[Pa]	1×10^{-7}
[V]	[kPa]	1×10^{-10}
[V]	[Torr]	7.5×10^{-10}
[V]	[mTorr]	7.5×10^{-7}

Conversion curve



B 4: Measuring Board CP300C9, 4 … 20 mA

Conversion formulae

$$p = d \times 10^{(7/16 \times I)}$$

$$I = 16/7 \times (\log p - \log d)$$

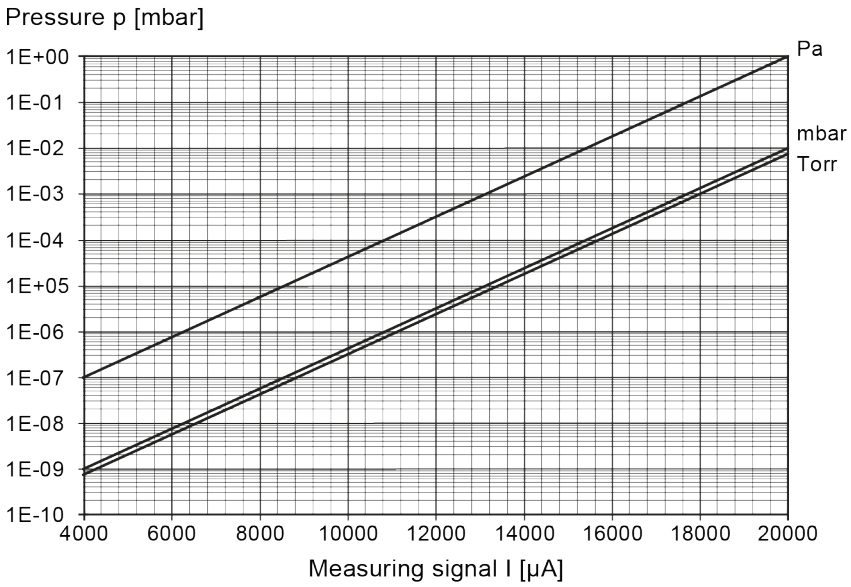
valid in the range:

1×10^{-9} mbar < p < 1×10^{-2} mbar
7.5×10^{-10} Torr < p < 7.5×10^{-3} Torr
1×10^{-7} Pa < p < 1 Pa

where

Measuring signal (output current) I	Pressure p	Constant (pressure unit dependent) d
[mA]	[mbar]	1.778×10^{-11}
[mA]	[Pa]	1.778×10^{-9}
[mA]	[kPa]	1.778×10^{-12}
[mA]	[Torr]	1.334×10^{-11}
[mA]	[mTorr]	1.334×10^{-8}

Conversion curve



B 5: Measuring Board CP300T11/T11L, 0 … 10 V

Conversion formulae

$$p = c \times 10^{(0.9 \times U)}$$

$$U = 10/9 \times (\log p - \log c)$$

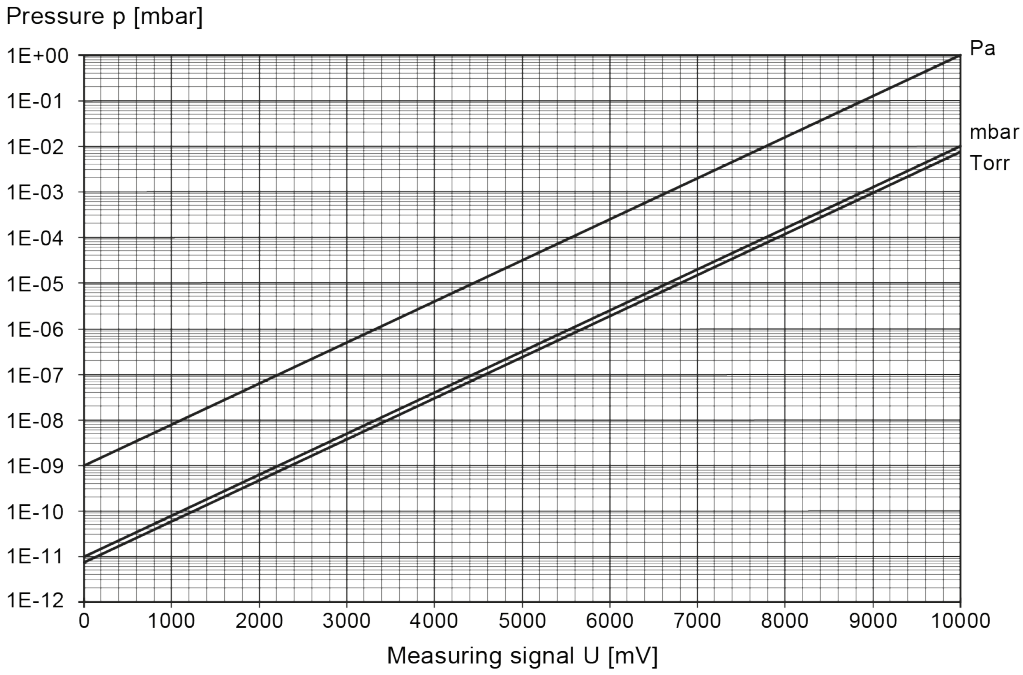
valid in the range:

1×10^{-11} mbar < p < 1×10^{-2} mbar
7.5×10^{-12} Torr < p < 7.5×10^{-3} Torr
1×10^{-9} Pa < p < 1 Pa

where

Measuring signal (output voltage) U	Pressure p	Constant (pressure unit dependent) c
[V]	[mbar]	1×10^{-11}
[V]	[Pa]	1×10^{-9}
[V]	[kPa]	1×10^{-12}
[V]	[Torr]	7.5×10^{-12}
[V]	[mTorr]	7.5×10^{-9}

Conversion curve



B 6: Measuring Board CP300T11/T11L, 4 … 20 mA

Conversion formulae

$$p = d \times 10^{(9/16 \times I)}$$

$$I = 16/9 \times (\log p - \log d)$$

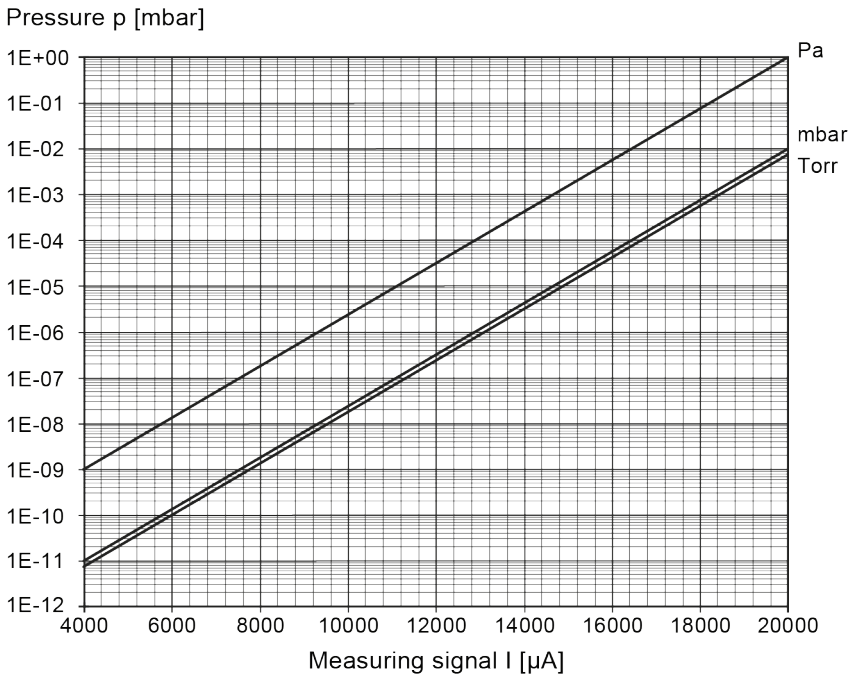
valid in the range:

1×10^{-11} mbar < p < 1×10^{-2} mbar
7.5×10^{-12} Torr < p < 7.5×10^{-3} Torr
1×10^{-9} Pa < p < 1 Pa

where

Measuring signal (output current) I	Pressure p	Constant (pressure unit dependent) d
[mA]	[mbar]	5.620×10^{-14}
[mA]	[Pa]	5.620×10^{-12}
[mA]	[kPa]	5.620×10^{-15}
[mA]	[Torr]	4.215×10^{-14}
[mA]	[mTorr]	4.215×10^{-11}

Conversion curve



C: Firmware Update

If your TPG500 firmware needs updating, e.g. for implementing a new gauge type, please contact your nearest INFICON service center.

A firmware update is possible

- via a USB memory stick (type A connector on the front of the unit), or
- with the USB Update Tool via the USB type B connector on the rear of the unit.

User Parameters

Most of the settings you may have made in the Parameter mode will not be affected by a firmware update. However, we recommend that you save the parameters before an update (→ 🗎 45).

Firmware update with a USB memory stick (type A)

Not all USB memory sticks are automatically recognized by the TPG500, as they (particularly cheaper brands) do not always conform to USB standard specifications. Try a different memory stick before contacting your nearest INFICON service center.

1. Download two files with the ending ".S19" and ".CNF" from our website "www.inficon.com" to a USB memory stick.
2. Switch off the unit.
3. Plug in the memory stick and then turn on the unit.
4. The update occurs automatically in the following steps:

`BOOTING`	Very brief.
`BOOTLOADER Vx.xx`	Very brief.
`ERASING FW...`	Old firmware is being deleted from the unit.
`UPDATING FW...`	New firmware is being loaded onto the unit.
`UPDATE COMPLETE`	Update completed.

5. Remove the memory stick and the unit will restart automatically.
6. If necessary, customer-specific settings saved before the update may now be resaved to the unit (→ 🗎 45).

Firmware update with USB Update Tool (USB type B)

Precondition: Windows XP, 7, 8 or 10 operating system

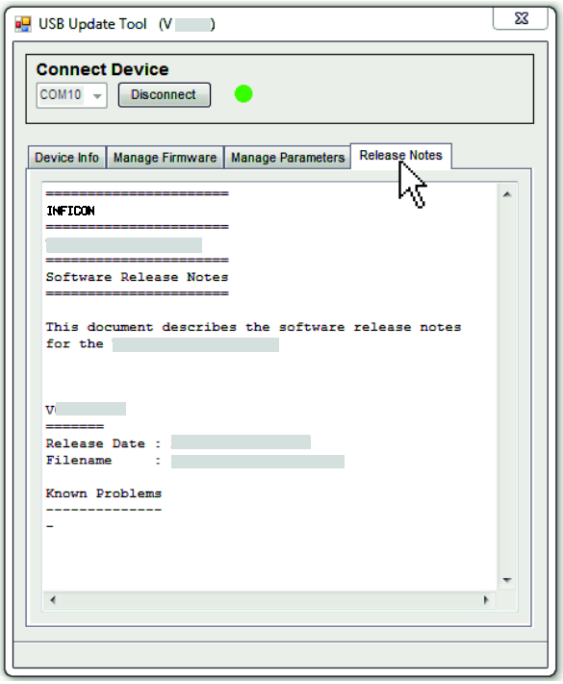
During firmware update, no USB memory stick should be connected on the front of the unit.

If a virtual serial interface (COM) is not automatically established, you may download and then install the driver from the website "https://ftdichip.com/drivers/vcp-drivers".

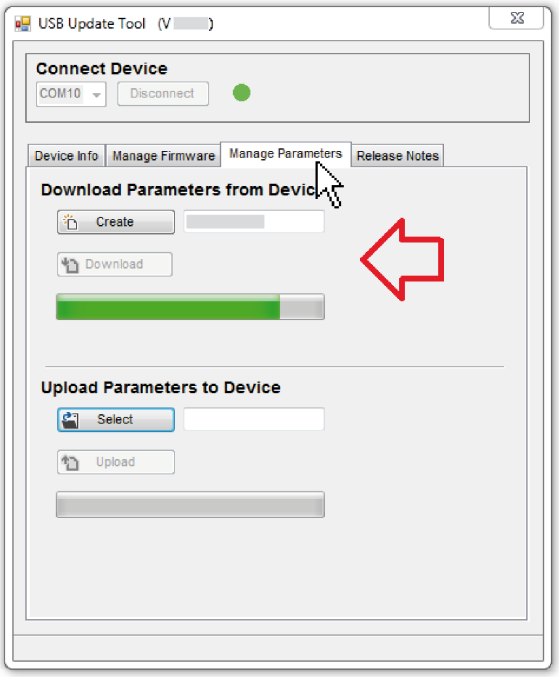
1. Download the USB UpdateTool from our website "www.inficon.com" or copy it from the enclosed CD ROM.
2. Connect the unit to the PC using a type A/B USB cable.

❸ Start USB UpdateTool, select the COM interface from the menu and click on <Connect>.

❹ Click on <Release Notes> tab page to view the software release notes.

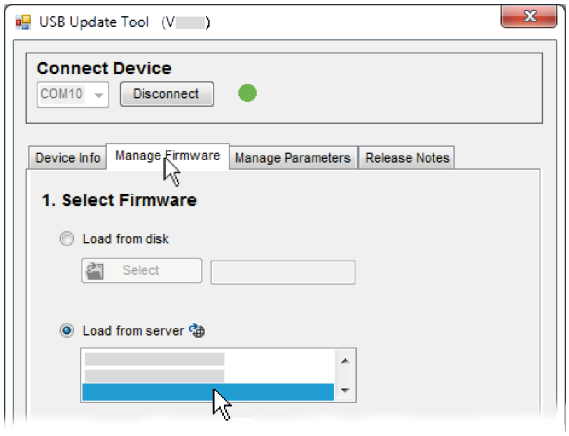


❺ We recommend that you download the parameters on the <Manage Parameters> tab page before an update.

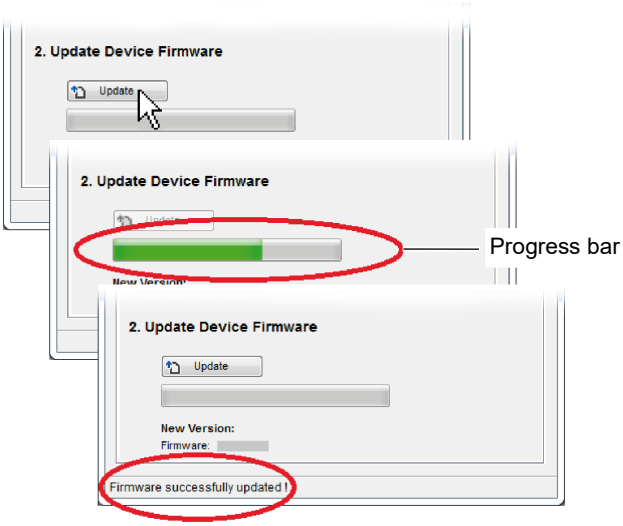


❻ Click the <Manage Firmware> tab page, select firmware …

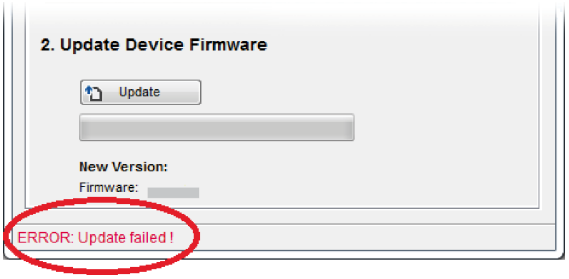
- Option <Load from disk>: Download a copy of the firmware from our website "www.inficon.com". Then, select the appropriate folder in the update tool.
- Option <Load from server>: The update tool connects to the update server. Select the desired firmware version from the selection list.



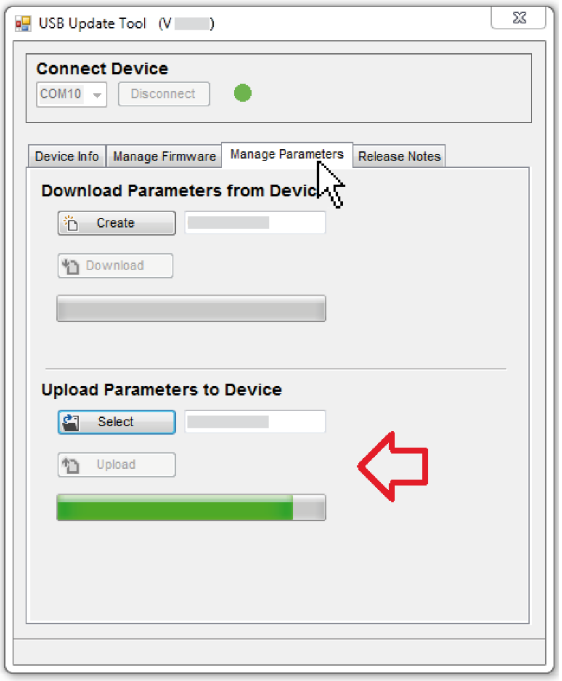
… and click <Update>: The firmware is updated.



If the update was not successful, try again.

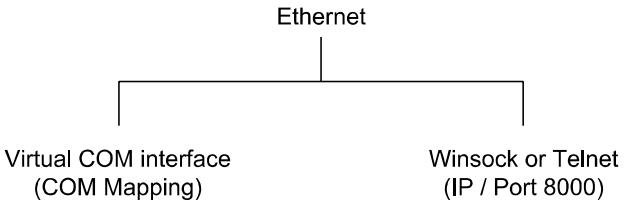


❼ Upload parameters back to device.



D: Ethernet Configuration

The TPG500 can be connected via the virtual COM interface or via Winsock / Telnet.



Virtual COM interface (COM Mapping)

The user program (e.g. terminal program, LabView, etc.) must support serial interfaces. Under Microsoft Windows operating systems the TPG500 is listed as a virtual COM interface.

The virtual COM interfaces allow you to access each program that supports serial interfaces (e.g. terminal program, LabView, etc.).

Please contact your network administrator, before starting Ethernet configuration.

Your operating system should be updated first. Additionally, administrator rights are required.

D 1: Connect the TPG500 to a Network

With registration

1. Readout the MAC address of the TPG500 (→ 🗎 47).
2. The TPG500 should be registered in the network by the network administrator. After registration ask him for the Ethernet parameters (IP ADDRESS, GATEWAY, NETMASK and DHCP).
3. Configuring the TPG500:
   - Save all TPG500 parameters on a USB memory stick ("SAVE SETUP", → 🗎 45).
   - Set the Ethernet parameters (IP ADDRESS, GATEWAY, NETMASK and DHCP) in the saved CSV file on the memory stick.
   - Load the modified parameters onto the TPG500 ("RESTORE SETUP", → 🗎 45).
   - Connect the TPG500 with an Ethernet patch cable to the network.
4. Search for the TPG500 in the network using the Ethernet Configuration Tool and assign it to a virtual COM interface (→ 🗎 99).
5. Start the program for communication with the TPG500 and connect it to the assigned COM interface.

Without registration

1. If unknown, ask the network administrator for the Ethernet parameters (IP ADDRESS, GATEWAY, NETMASK and DHCP).
2. Configuring the TPG500:
   - Save all TPG500 parameters on a USB memory stick ("SAVE SETUP", → 🗎 45).
   - Set the Ethernet parameters (IP ADDRESS, GATEWAY, NETMASK and DHCP) in the saved CSV file on the memory stick.
   - Load the modified parameters onto the TPG500 ("RESTORE SETUP", → 🗎 45).
   - Connect the TPG500 with an Ethernet patch cable to the network.
3. Search for the TPG500 in the network using the Ethernet Configuration Tool and assign it to a virtual COM interface (→ 🗎 99).
4. Start the program for communication with the TPG500 and connect it to the assigned COM interface.

D 2: Connect the TPG500 to a Computer

Computer with DHCP server

1. Connect the TPG500 to a computer …
   - with a crossover Ethernet cable,
   - via a switch, or
   - with an Ethernet patch cable (precondition: the interface is auto MDI-X capable).
2. The DHCP server assigns automatically an IP address.
   Precondition: DHCP = ON
3. Search for the TPG500 in the network using the Ethernet Configuration Tool and assign it to a virtual COM interface (→ 🗎 99).
4. Start the program for communication with the TPG500 and connect it to the assigned COM interface.

Computer without DHCP server

1. Save all TPG500 parameters on a USB memory stick ("SAVE SETUP", → 🗎 45).
2. Set the following Ethernet parameters in the saved CSV file on the memory stick:

IP ADDRESS:	192.168.0.1 (192.168.0.2 for a second unit, and so on)
NETMASK:	255.255.0.0
DHCP:	OFF

3. Load the modified parameters onto the TPG500 ("RESTORE SETUP", → 🗎 45).

❹ Connect the TPG500 to a computer …

- with a crossover Ethernet cable,
- via a switch, or
- with an Ethernet patch cable (precondition: the interface is auto MDI-X capable).

❺ Search for the TPG500 in the network using the Ethernet Configuration Tool and assign it to a virtual COM interface (→ 🗎 99).

❻ Start the program for communication with the TPG500 and connect it to the assigned COM interface.

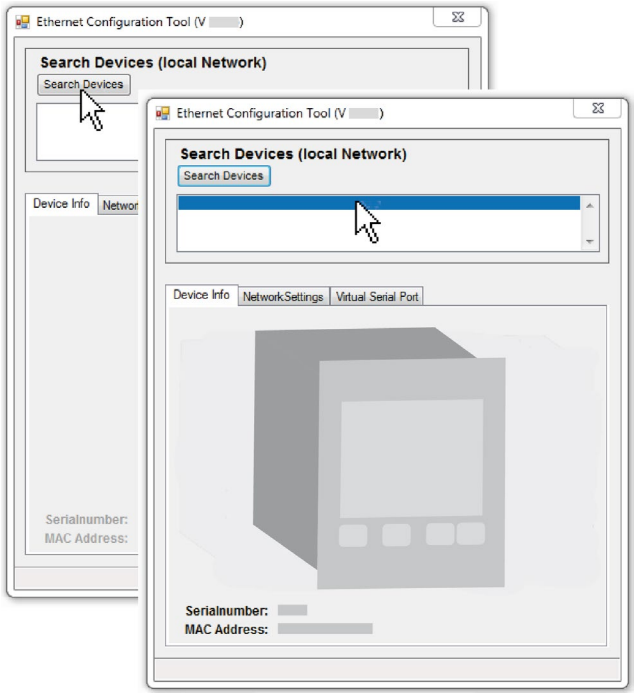
D 3: Ethernet Configuration Tool

With the Ethernet Configuration Tool, a virtual serial interface (COM) can be assigned to an IP address. In addition, it allows configuration of the Ethernet interface via a computer.

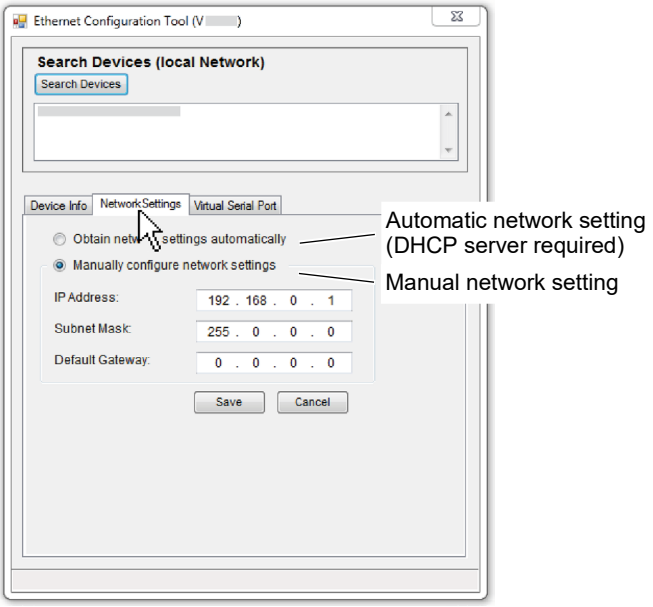
Precondition: Windows 7, 8 or 10 operating system (does not work on Windows XP)

❶ Download the Ethernet Configuration Tool from our website "www.inficon.com" or copy it from the enclosed CD ROM.

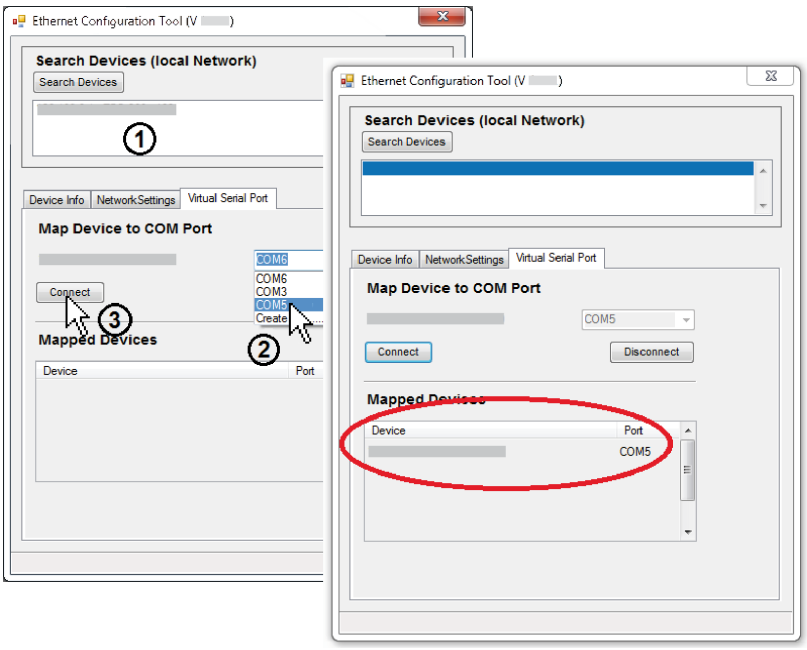
❷ Start the Ethernet Configuration Tool and click on <Search Devices>: The tool searches the local network for connected devices and lists the devices found in the selection window. The <Device Info> tab page shows basic information about the selected device.



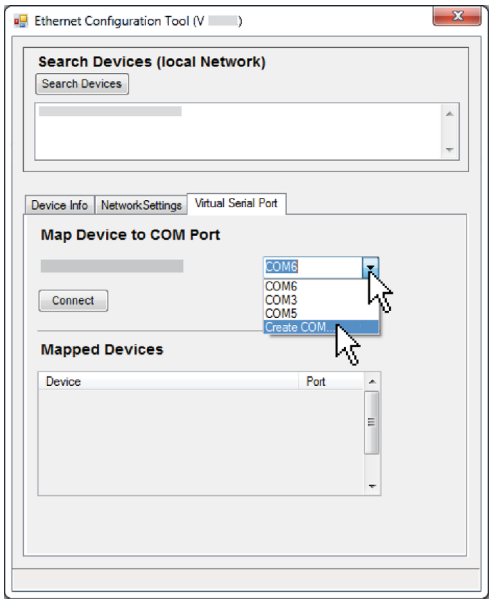
❸ The <Network Settings> tab page is where the automatic or manual network settings are configured.



❹ On the <Virtual Serial Port> tab page, you can assign a separate COM Port to each device, and/or …



… generate a new COM Port.



E: Literature

🕮 [1] Operating Manual
Plug-In Boards for Total Pressure Gauge Controller TPG300, TPG500
IG9972BEN
INFICON AG, LI-9496 Balzers, Liechtenstein

🕮 [2] Operating Manual
Pirani Gauges TPR018
IG9976BEN
INFICON AG, LI-9496 Balzers, Liechtenstein

🕮 [3] Operating Manual
Cold Cathode Gauge IKR084, IKR085, IKR086
IG9048BEN
INFICON AG, LI-9496 Balzers, Liechtenstein

🕮 [4] Communication protocol
Profibus-DP Interface Board IF300P, IF301P
IG9973BEN
INFICON AG, LI-9496 Balzers, Liechtenstein

🕮 [5] Communication protocol
Profinet Interface Board for Total Pressure Gauge Controller TPG500
IG9014BEN
INFICON AG, LI-9496 Balzers, Liechtenstein

ETL Certification

C ETL US LISTED
Intertek
4010094

ETL LISTED

The product TPG500

- conforms to the UL Standards UL 61010-1:2012 Ed.3+R:21Nov2018 and UL 61010-2-030:2012 Ed.1+R:16Sep2016
- is certified to the CAN/CSA Standards CSA C22.2#61010-1-12:2012 Ed.3 +U1;U2;A1 and CSA C22.2#61010-2-030:2018 Ed.2

EU Declaration of Conformity

CE

We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the following directives:

- 2014/35/EU, OJ L 96/357, 29.3.2014
  (Low Voltage Directive; Directive relating to electrical equipment designed for use within certain voltage limits)
- 2014/30/EU, OJ L 96/79, 29.3.2014
  (EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
  (RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

Total Pressure Gauge Controller
TPG500

Standards

Harmonized and international/national standards and specifications:

- EN 61000-3-2:2014, Class A
  (EMC: limits for harmonic current emissions)
- EN 61000-3-3:2013
  (EMC: limitation of voltage changes, voltage fluctuations and flicker)
- EN 61000-6-1:2007
  (EMC: generic immunity for residential, commercial and light-industrial environments)
- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-4:2007 + A1:2011
  (EMC: generic emission standard for industrial environments)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61010-2-030:2010
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A
  (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

23 January 2023

Dr. Christian Riesch
Head of Development

23 January 2023

Denis Hari
Product Manager

UKCA Declaration of Conformity

We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the following regulations:

- S.I. 2016/1101, 11.2016
  (Low Voltage Regulation; Regulation relating to electrical equipment designed for use within certain voltage limits)
- S.I. 2016/1091, 11.2016
  (EMC Regulation; Regulation relating to electromagnetic compatibility)
- S.I. 2012/3032, 12.2012
  (RoHS Regulation; Regulation on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

Total Pressure Gauge Controller
TPG500

Standards

Harmonized and international/national standards and specifications:

- EN 61000-3-2:2014, Class A
  (EMC: limits for harmonic current emissions)
- EN 61000-3-3:2013
  (EMC: limitation of voltage changes, voltage fluctuations and flicker)
- EN 61000-6-1:2007
  (EMC: generic immunity for residential, commercial and light-industrial environments)
- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-4:2007 + A1:2011
  (EMC: generic emission standard for industrial environments)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61010-2-030:2010
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A
  (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

23 January 2023

Dr. Christian Riesch
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23 January 2023

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